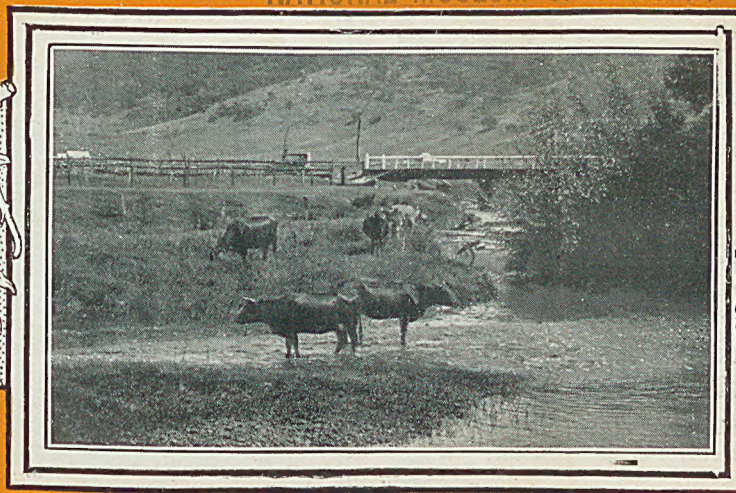
VOL. XXIX. [Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.] PART 8.

THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF VICTORIA, AUSTRALIA.

NATIONAL MUSEUM OF VICTORIA



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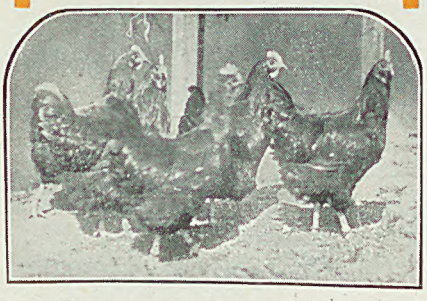

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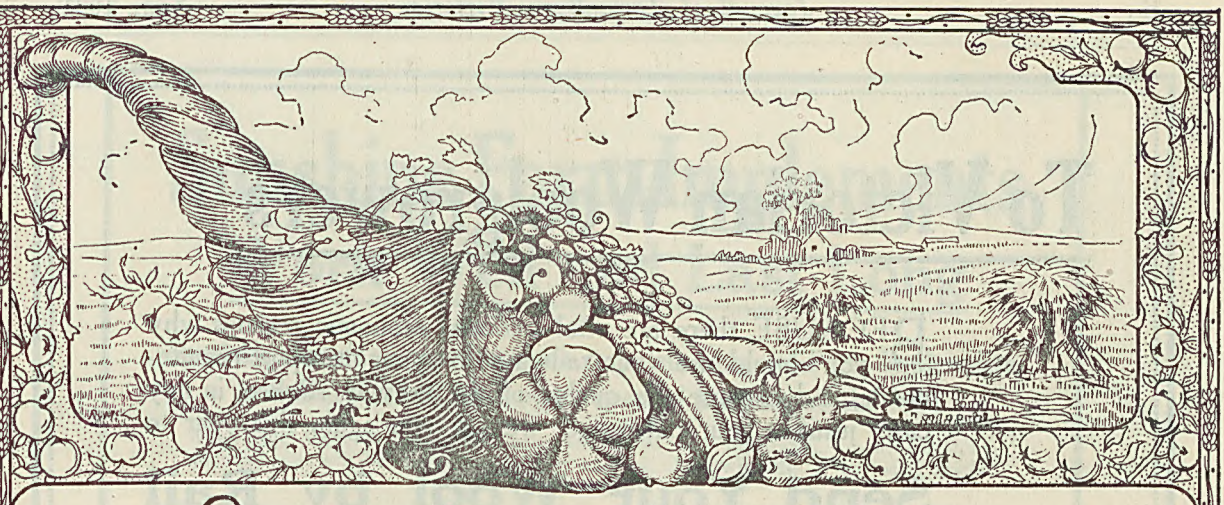

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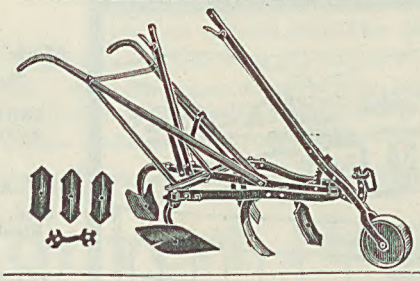

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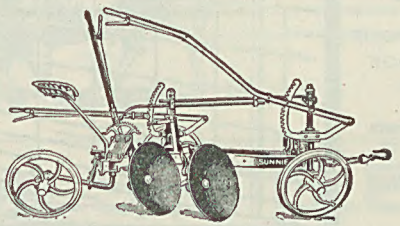

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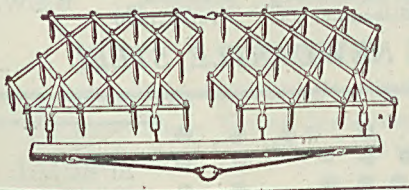

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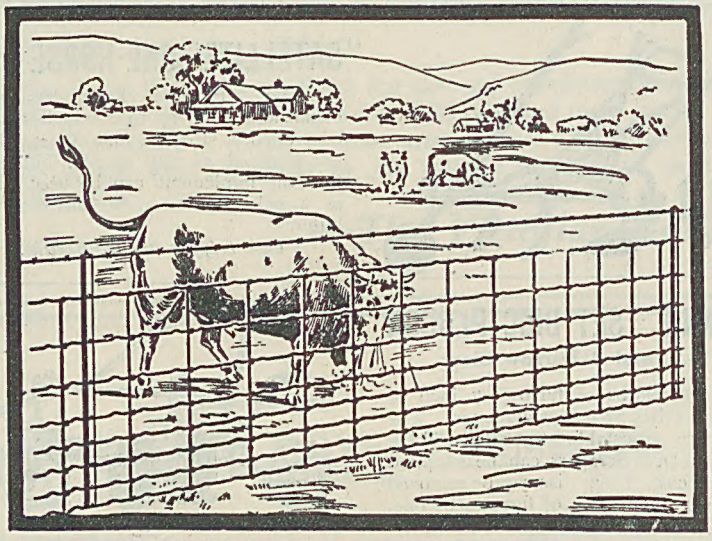

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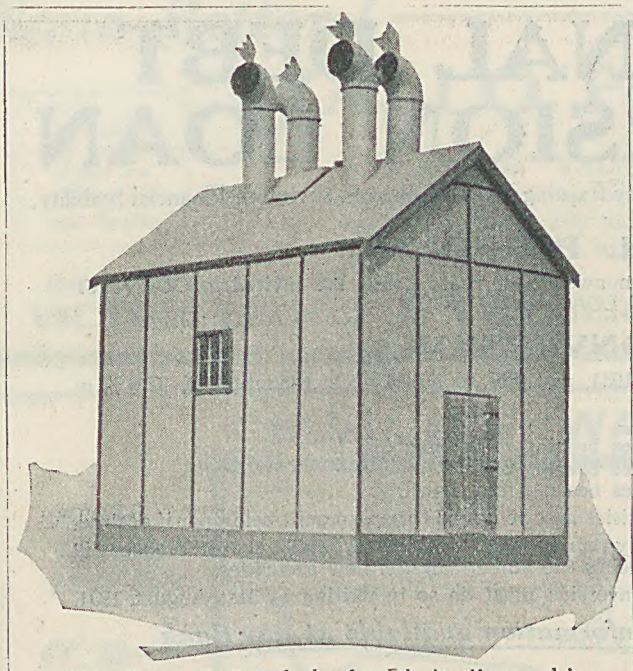

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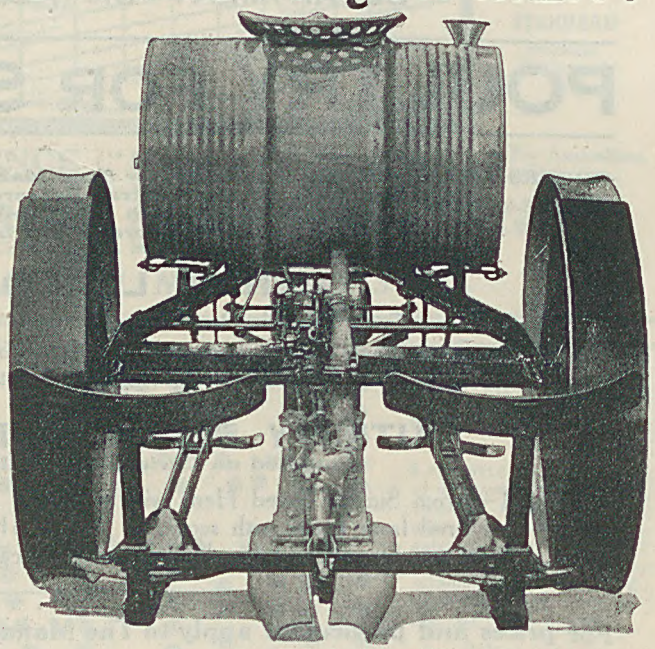

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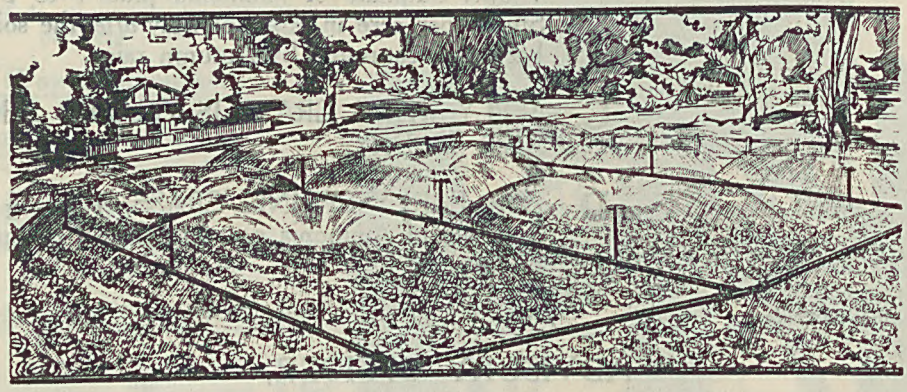

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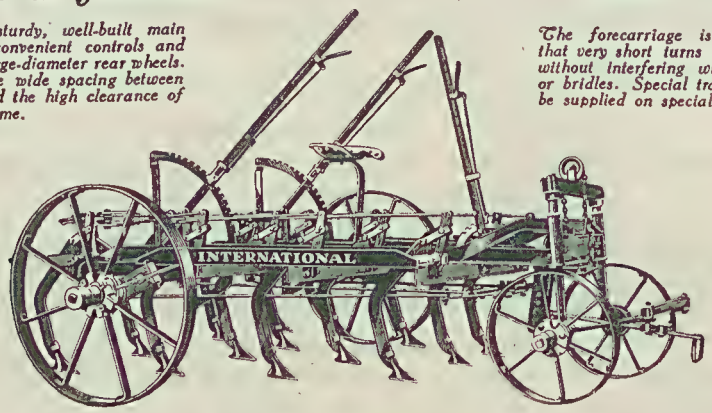

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NATIONAL MUSEUM OF VICTORIA

The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Grazing Cereal Crops

The Effect on the Plant

By H. C. Forster, M.Agr.Sc., and A. J. Vasey, B.Agr.Sc., Agricultural Research Officers, State Research Farm, Werribee.

THE practice of grazing cereal crops in Victoria is one which varies in importance with seasonal conditions, the area of crop so treated depending largely on the amount of other feed available for stock during the winter months. Further, in certain districts in favorable seasons it is thought advisable to check dense rank growth, and this is accomplished by feeding off to sheep. The success of the practice depends largely on the efficiency of the management of the grazing. Probably the most important consideration is the condition of the soil at the time. Under very wet conditions it is always undesirable, and as a matter of fact can be done reasonably efficiently only under fairly dry conditions of surface soil. Further, evenness of grazing is usually best obtained by the heavy stocking of comparatively small areas of crop for a short time, ewes and lambs being generally considered the most suitable sheep for the purpose.

These facts are well known. Recent observations on the growing crop have shown, however, that there are further important points to be considered in connexion with the effect of the grazing on the crop itself, and it is the purpose of this article to briefly outline these. These observations were made at the State Research Farm, Werribee, and other centres in the wheat belt of Victoria during the crop census investigations carried out by the writers between 1927 and 1931.

Grazing the Oat Crop.

In the wheat belt of Victoria the oat crop is sown, as a rule, on stubble in March or April. With good early rains, growth is obtained in May, and this usually is grazed to the lambing ewes of the farm flock throughout the winter, later being shut up and, spring rains being favorable, a crop of hay or grain is obtained. Briefly, the oats are sown, firstly, as a hay or grain crop, the provision of winter feed for sheep being an important, but nevertheless a secondary, consideration. The successful combination of these two methods of utilizing the crop largely depends on how far into the spring the grazing can be continued without seriously reducing the possible yield of the crop for hay or grain; and it is to just this question that the following observations apply.

Let us first consider the oat plant itself. Soon after its establishment it commonly consists of three main or primary stools with a varying number of smaller or secondary stools, as suggested in the sketch in Fig. 1. In this grassy or vegetative stage it continues throughout the winter months, and while in this condition may be grazed quite severely without serious damage. The stools which are grazed off grow again, and the recovery generally is rapid. One point, however, must be watched, and that is the pulling up of the plants when

the sheep are getting down to the tougher plant bases towards the end of a grazing.

In the early spring months, however, the story alters. Closely connected with the increase in the length of day, the type of growth produced by the plant changes from the vegetative or grassy to the reproductive or stemmy growth. This is a danger signal.

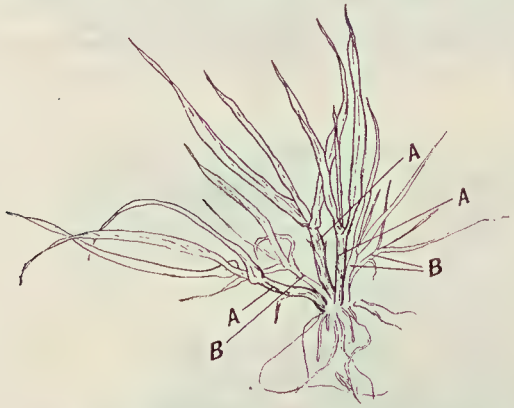


Fig. 1.—Oat plant in grassy stage in which condition it may be grazed safely.
Note primary (A) and secondary stools (B).

With this change the developing heads leave the base of the plant and commence to grow upwards with the elongation of the stem. These miniature heads are found just above the first or topmost node or knot on the stem, which may be easily seen by slitting the stem with a penknife. **It is advisable to stop the grazing immediately this first node on the main stools comes within reach of a sheep's bite.** Should this node (and head) be eaten off the stool dies, and while the secondary stools are forced into growth, the crop of grain from these usually is weak. Figs. 2 and 3 illustrate these points.

When does this critical change in growth occur? It is largely a question of the variety of oats being grown. The difference between early and late varieties is almost entirely in the length of the grassy stage. The following are the approximate critical dates of change of growth for the varieties of oats most commonly grown:—

Variety.	Critical Date.
Early Varieties—	
Palestine ..	Mid August.
Mulga	
Burt's Early ..	
Sunrise ..	
Mid Season—	
Lachlan ..	End August,
Late Varieties—	
Algerian ..	Mid September.

Fig. 2.—Oat plant showing typical recovery after judicious early grazing.

Although at the present time probably 80 per cent. of the oats grown in Victoria are of the Algerian variety, larger areas are being sown each year to the earlier varieties in the northern districts where early green feed for fat lamb-raising is required. They have two advantages over Algerian—they are superior in the production of early green feed, and though grazing must be stopped earlier in the spring, they are more consistent grain and hay yielders than Algerian under the drier conditions of the northern districts. Really the lateness of its start to heading, the quality which allows the later grazing, is responsible for the weakness of Algerian in this respect. Furthermore, it must be remembered that feed in August and September is not so valuable

as feed in June and July. Usually by this time of the season the pastures of the northern districts are supplying considerable quantities of feed.

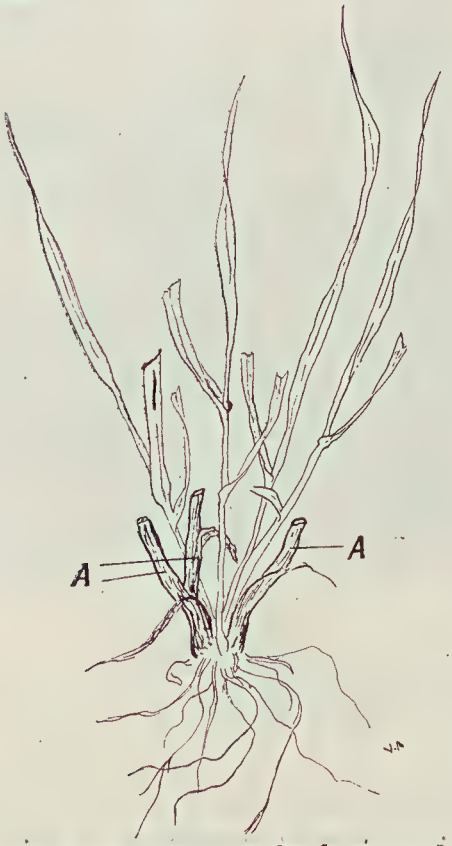


Fig. 3.—Oat plant which has been grazed too late in season.

Note dying bases of the primary stools (A) with the weaker secondary stools forced into growth.

These precautions as regards time of grazing cereal crops will not ensure a hay or grain crop irrespective of the spring rains, but they do mean that the crops will be in a condition to make the best possible response to the moisture which is available. Unfortunately the critical dates quoted above are at best only approximate. Many factors may combine to alter them considerably. It is therefore essential that the growth stages of each crop be very closely watched.

Grazing the Wheat Crop.

The grazing of wheat crops is not such a common practice as that of grazing oats, and where practised is usually determined by two important considerations: firstly, the scarcity of other sheep feed during the winter months;

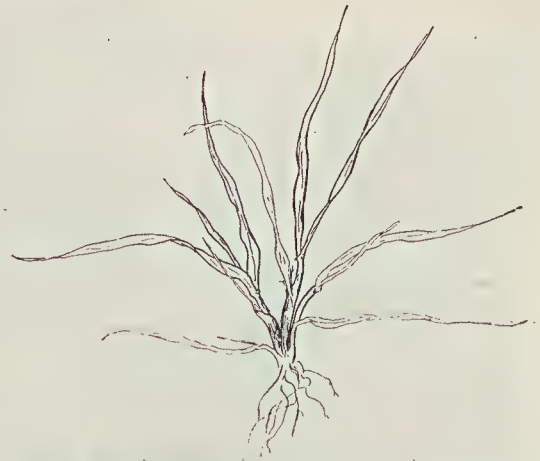


Fig. 4.—Wheat plant in grassy stage which allows of safe grazing. Plant from crop sown in late May and observed in July.

and, secondly, the desire to check a crop which has experienced very favorable growing conditions, lest the moisture available in the spring be insufficient to carry such a dense crop through to harvest.

The same general features characterize the wheat plan in the grassy stage as were described in the case of oats. Judicious grazing does

Fig. 5.—Oat plant showing vigorous secondary stooling (B), similar to the early growth in dense wheat crops which it is desirable to check.

little harm to the crop while it is in this condition. (Fig. 4.) Wheat being essentially a grain crop, however, grazing must cease immediately the critical date for change of growth is approached, and for the early and mid-season varieties this may be taken fairly generally as *the end of August*. Later grazing is advisable only on such varieties as Major.

Fig. 6.—Oat plant showing typical recovery after judicious grazing of such a plant as that in Fig. 5.

Note secondary stools definitely checked and increased dominance of important primary stools.

The grazing of the wheat crop with sheep feed as a secondary consideration—the main idea being to effect an improvement in the condition of the crop itself—involves certain new factors which need special consideration. Dense sappy crops, the result of very favorable winter-growing conditions, usually mean a vigorous development of secondary stools as that of the oat plant sketched in Fig. 5. Rarely do we find this condition in the early varieties as Rajah and Ranee; it is, however, more common with the mid-season variety Federation, and later types, Major and Wannon. The results of the observations over the past four years suggest that this secondary stooling is generally nothing but a liability to the plant. Actually the sooner the suppression of this secondary stooling is obtained the better for the crop, as this results in more efficient head production. Most of the small stools die off in any case when the pinch comes in September-October. Before that time, however, if the moisture supply should be at all limited, they may, by their demands, have handicapped severely the head development on the main stools.

It was thought once that feeding-off increased stooling of wheat crops. This is hardly the case. It may increase effective stooling, that is, increase the number of heads produced at harvest, but this is not necessarily achieved by increasing the number of stools per plant. The observations have shown that, after grazing a plant such as that shown in Fig. 5, further growth takes place more along the lines indicated in Fig. 6. This shows the secondary stools definitely checked, with an increased dominance of the important primary stools. Probably the greatest improvement from such a grazing as this is to be noted on early-sown crops of Federation on the black soils of the Wimmera.

At the time of writing, wheat plants were not available for sketching for Figs. 5 and 6. In both cases the plants depicted are oats. This does not detract in any way from the value of these figures, as, in our view, the similarity in type of growth and recovery of oats and wheat under such conditions is very close.

Tobacco Growing

I.—Soil and Climatic Conditions

By W. J. B. McDonald, B.Agr.Sc., Assistant Inspector of Agriculture; and G. E. Coghlan, Tobacco Field Officer.

THE reduced purchasing power of the Australian public has given the tobacco-grower here a unique opportunity of establishing his leaf on the local market. Attracted by the lower price at which locally-grown tobacco can be sold, the smoker is creating a demand which at the moment it is difficult to meet. In order to maintain supplies for the manufacture of established lines of Australian-grown tobacco, buyers during the past season paid high prices for the bulk of the Australian crop—prices that were made possible only by the duty of 5s. 2d. a lb. levied on all imported tobacco.

Despite the lower figure at which manufactured Australian tobacco can be purchased, it may be many years before it entirely displaces imported tobacco in the Australian market, and while this change is taking place the amount of locally-grown leaf that can be sold at profitable prices possibly will be limited to the amount of it the public will consume. Any sudden substantial increase in the production of Australian tobacco is bound to lead to a glut in the local market, with a resultant sharp decline in price.

Intrigued by the relative prosperity of the tobacco-grower at a time when the bulk of the population is suffering acute financial embarrassment, innumerable individuals from every branch of commercial, industrial, and agricultural activity are considering the growth of tobacco as a possible means of regaining their financial stability. The majority of these people, however, are likely to be sadly disillusioned. From the nature of the inquiries

addressed to this Department it is plain that the bulk of the inquirers have no conception of the monetary outlay involved in establishing themselves as growers, nor of the amount of labour and degree of skill required in producing tobacco in the form in which it is purchased by the buyer. Misled by the ease with which the tobacco plant can be grown over a large proportion of the State, they apparently believe that this can be taken as an indication of the ease with which commercial tobacco can be produced.

Saleable tobacco can be grown only under a very limited range of soil and climatic conditions, and even under these circumstances painstaking care and constant attention to detail, combined with considerable experience in the processes involved in the various phases of production, are necessary to the growth of good quality leaf. The necessity for producing this type of leaf has not been generally recognized. This probably is due to the fact that, in recent years, the amount of leaf placed on the market in any one season has not been sufficiently large to warrant a discriminating demand on the part of the buyer. However, if only a proportion of the growers who have signified their intention of growing tobacco next season do so, the amount of low-grade leaf produced should more than meet the demand for this class of tobacco, and the purchaser would be in a position where he could exercise some discrimination in the nature of his purchase. Under such conditions, an assured market at remunerative prices would exist only for good quality leaf. Such leaf cannot be produced by the unskilled grower.

As to the profits in tobacco-growing, it may be pointed out that those growers who have been producing tobacco for many years and have acquired considerable skill and judgment in handling the crop to the best advantage know that the expense and risk incidental to tobacco-growing reduce the average profit over a number of years to a figure that is merely a normal return for the amount of capital invested and labour involved. The disease, blue mould, which in years favorable to its development may cause a total loss to the grower, is not yet under control, while, in non-irrigable areas, periods of drought greatly reduce the amount and value of the crop. The cost of producing tobacco is variously estimated at from £30 to £40 per acre. A curing barn of a sufficient size to handle 7 or 8 acres of crop costs approximately £120. It must be recognized that for the unskilled grower, with but a limited amount of capital to invest, tobacco-growing is not a good risk.

Soil and Climatic Requirements.

Climatic and soil conditions are indissolubly linked in their relation to the production of good quality tobacco, and it is only in certain districts of this State that both these factors are suitable to the growth of this crop. Outside the North-Eastern, Pomonal, and Shepparton Districts tobacco-growing is still in an experimental stage. The abnormal weather conditions prevailing during the past summer favoured the growth of tobacco in areas that under normal conditions are not suited to its production. While it is not claimed that all areas possibly suited to the growth of tobacco have been exploited, it is well to bear in mind that results obtained during an abnormal period are not likely to be repeated over a number of years.

In texture, colour, and smoking quality the leaf is largely influenced by soil type. In the older tobacco-growing countries of the world it is generally recognized that tobacco grown in different districts can be relied on to exhibit definite characteristics peculiar to those particular areas. Cuban tobacco, for example, exhibits certain characters which have never been successfully emulated elsewhere, while Virginian tobacco possesses entirely different but no less distinctive qualities.

Bearing this intimate relation between tobacco and soil and climatic conditions in mind, the selection of suitable localities for its growth becomes of paramount importance. Loams, heavy loams, clay soils, and soils usually described as rich, are not suited to tobacco. It is a matter for regret that, following on the precedent set by the early Chinese growers, a good proportion of the leaf produced in this State is still grown on rich river flats, the heavy character of which is reflected in the nature of the leaf produced.

The stiff soils of the Goulburn Valley, the rich black loams of the Wimmera, and the shallow soils that characterize the grazing lands of the State are not conducive to the growth of quality tobacco. The most suitable soils can be described briefly as sands or light sandy loams having very little value for the production of the staple Victorian crops. A depth of 15 inches to 18 inches of surface soil

affords the medium most favorable to satisfactory growth. Where irrigation facilities are not available, there should be a good retentive subsoil which acts as a reservoir for moisture during the growing period of the crop. A high salt content in the soil has such a pronouncedly bad effect on the burning qualities of the leaf that such soils cannot be used for its growth. Excessive moisture at any period of the plant's history has a detrimental effect, resulting either in death, or an unhealthy condition with increased susceptibility to disease. Adequate drainage, therefore, becomes a first essential.

Tobacco Seed-beds in the making.

The tobacco plant is particularly susceptible to climatic variations, even the cured leaf registering these with unfailing regularity. Being a summer growing plant, tobacco requires a fairly regular incidence of rain during these months. Although the crop will withstand periods of comparative dryness, the resultant check in the regularity of growth results in a degradation of quality in the cured leaf. For this reason 5 inches to 6 inches of rain evenly distributed between the end of September and the end of January is considered an essential in non-irrigable areas. Where irrigation facilities are available, rainfall from the aspect of soil moisture becomes of relatively minor importance. In these areas the clay subsoil is not so essential, while the importance of adequate drainage and freedom from injurious salts is intensified.

In considering the potentialities of any district for the production of tobacco, the incidence of the first and last frosts is an important limiting factor. From the time transplanting of the seedlings commences in November until the end of April when, in normal seasons, curing operations should be practically completed, there should be an entire absence of frosts. While frosts are liable to cause a considerable amount of damage to the young plant, the greatest danger is liable to occur when the almost mature plant is subjected to frosty conditions. At this stage the tissue of the leaf is killed, and when subjected to the curing process, the necessary changes within the leaf cell do not occur. The frosted portions disintegrate, and are entirely lost. A heavy frost just prior to the harvesting of the leaf could result in enormous monetary loss.

Less generally recognized climatic influences relate to uniformity of temperature during the growing season—particularly when the crop approaches maturity—and the prevailing degree of humidity. While not limiting the growth of the crop, these two factors exert an as yet ill-defined, but nevertheless important influence on quality. It is known that extreme dryness of the atmosphere induces a harshness and lack of elasticity in the leaf, a very undesirable condition from the manufacturer's point of view.

The fact that experienced growers welcome the occurrence of dewy weather during the ripening period is a tribute to the beneficial influence of humid conditions. For the proper maturing of the leaf, a certain high level of temperature during the ripening period is necessary. Over a great proportion of the State this high level is not maintained. This fact is considered partly responsible for the difficulty experienced in maturing leaf in such areas as Melbourne and suburbs; and in many of the southern districts of this State, The bulk of the wheat-growing areas and many southern districts of the State do not provide the soil and climatic conditions necessary for tobacco.

In choosing a site for the growth of tobacco some additional aspects have to be considered. Owing to the broad and luxuriant nature of its foliage, the tobacco plant is liable to considerable damage when exposed to heavy winds. To obviate this every protection afforded by

the natural vegetation and the contour of the ground surface should be exploited. In certain districts, some measure of protection could be achieved by the growth of a crop such as maize which could be planted round the edge of the field and strips of which could be interspersed throughout the tobacco crop, every half-chain or so.

To obtain the greatest benefit from the sun, it is advisable to select the site so that the tobacco plant is provided with a northerly or north-easterly aspect. Where possible, planting on a gentle slope is preferable to planting on flat ground.

Varieties.

There is a considerable diversity of opinion among growers as to the most profitable variety and, frequently, quantity is attained at the expense of quality. Since the progress of the industry depends on giving the consumer the kind of smoke his palate demands, growers are urged to choose varieties that will produce a better class of leaf. The following varieties, listed in order of preference, are recommended to growers from the point of view of quality of the cured leaf only:—Hickory Pryor, Yellow Pryor, White Burley, Gold Leaf, Adcock, Cash, Yellow Bud Pryor, Hyco, Conqueror, Spotted Gum, Dungowan, and White Stem Orinoco,

This general classification will naturally be modified to suit the different environments encountered in the varying districts of the State. Considering the main tobacco-growing districts in detail, the following classification based on existing practice is suggested as being suited to their individual characteristics:—

North-East.—Hickory Pryor, Conqueror, Gold Leaf, Dungowan, Spotten Gum.

Shepparton.—Gold Leaf, Hickory Pryor, White Stem, Orinoco, Dungowan, and Warne.

Pomonal.—Dungowan, Spotted Gum, Hickory Pryor.

Light Sandy Loams in Other Districts.—Hickory Pryor, Yellow Pryor, Gold Leaf, Dungowan, and Spotted Gum.

Some of the varieties listed have not been widely grown, but are suggested to growers as being worthy of a trial.

Some of the heavier-yielding varieties such as Blue Pryor, P. K., Medley Pryor, and Lacks, although giving a large quantity of leaf per acre, are yielding a type of tobacco which is not calculated to enhance the reputation of Australian leaf among the smoking public.

Construction of Seed Bed.

The tobacco seed is exceedingly minute in size and correspondingly delicate. It is estimated that one ounce contains approximately 300,000 seeds. Although the germination percentage is relatively low—varying round 30 per cent. under field conditions—the enormous number of plants that this figure represents, makes the cost of seed per acre surprisingly small. This aspect of seeding is offset by the added care, attention, and labour necessary. Unless properly sown in carefully prepared beds, suitably located, and attended with unremitting care, the seed may die shortly after germination. Should the seed be covered too deeply in sowing, or subsequent waterings not be sufficient to keep the bed in a suitably moist condition, the small seedlings may never reach the surface.

Even when the seedlings are established and grown to a satisfactory size, preliminary labour will have been in vain unless the soil of which the bed is formed is of such a character and texture that, when ready for transplanting, the seedling can be lifted out without damage to its roots or heart. It is essential, therefore, that seed-beds be constructed in soils from which the seedling can be removed without injury. Soils liable to set hard on the surface, crack, or dry out readily should be avoided. A well-drained sandy loam, not necessarily as poor as that advocated for the growth of the crop, is considered most satisfactory for this purpose. Protection from wind helps to maintain a moist condition of the bed—a very important feature, as the drying out of the surface layer before the tiny germinating seed has firmly established itself causes the death of the embryo plant. The beds should be so located that they are maintained in as warm a condition as possible. The rapidity of germination depends largely on the temperature of the bed.

After germination, the population of the seed-bed should not be too dense. Crowding of the beds favours the spread of disease. It is suggested that one ounce of seed should cover 100 square yards of seed-bed. This will provide sufficient plants for 5 acres.

In the actual preparation of the bed several methods are available to the grower. That described hereunder is the most rapid and economical procedure practised, and has given results comparable with more costly and involved methods.

Forming the Seed-bed—the right way.

Fallow the selected site during autumn, and work it down thoroughly during the following months to destroy as far as possible any weed growth. The greater the success achieved in weed destruction, the greater the amount of pains-taking labour that will be avoided in subsequent weeding operations. The land should be free from weeds and in good mechanical condition at the beginning of August, which month is regarded as a suitable sowing period. Some growers sow as early as the middle of July, while others carry their normal sowing period well into September.

To eliminate as far as possible the liability of total loss from an outbreak of Blue Mould, it is wise to have a succession of seed-beds coming on at intervals varying from one to two weeks. Under such circumstances, one lot possibly may escape climatic conditions favorable to the incidence of the disease.

From one to two weeks before the anticipated sowing date, 5 to 7 cwt. of superphosphate per acre should be incorporated in the soil. Should a deficiency of organic matter be suspected, 1 to 2 cwt. of blood manure may be included in the dressing.

Beds not more than 3 feet wide and any desired length may now be formed by throwing the earth from the proposed pathway between the beds on to the beds. By this means the latter will be raised 3 to 4 inches above the level of the path. Subsequent tramping of the path will increase this difference in elevation. The surface of the bed should be compacted, lightly raked, and smoothed off with a levelling board. It is then ready to receive the seed.

Should the seed be covered to any depth the young shoot will fail to reach the surface, consequently the seed is broadcast right on top of the smoothed surface of the bed. To obtain an even distribution of these very minute seeds, they must be thoroughly mixed with some convenient distributing agent, fine sand, ashes, or superphosphate being a suitable medium for this purpose. One ounce of seed, mixed with sufficient distributing agent to suit the convenience of the broadcaster conveniently covers 100 square yards of bed. If using superphosphate, 1 lb. to 10 sq. yds., in addition to that already worked into the bed, is suggested as a suitable dressing.

To ensure the uniform growth of each plant, a regular distribution in the seed bed is a preliminary requisite. A perfect disposition would be one plant for every square inch of bed. Such perfection in broadcasting is never achieved, but the care expended in aiming at this ideal will be well repaid. Seed should not be sown in very windy weather as this interferes with the evenness of spacing. The

Forming the Seed-bed—the wrong way.

distribution of the mixture in small quantities will ensure a more even sowing of the bed than an attempt to complete the broadcasting of a specified area without covering the same ground more than once. Having sown the seed, it is next set in the bed by means of a light roller or through pressure applied with a flat board or the back of a spade. If coarse, river-washed sand is available, the bed may be covered to a depth of from $\frac{1}{8}$ inch to $\frac{1}{4}$ inch with this material. Failing this, a sheet of hession stretched over the bed 3 inches to 4 inches above the surface provides a less economical, but more suitable cover. If sown under dry conditions, a light watering should immediately follow the completion of sowing operations. This should not be heavy enough to wash the seeds off the bed, or to cause them to run together.

If the beds are covered with hessian, this covering should be removed for subsequent waterings. The fact that the surface of the bed must never be allowed to dry out, nor yet remain in a saturated condition, is stressed.

Care of the Seedlings.

According to weather conditions subsequent to sowing, germination can be expected within three to four weeks early in the season, and in from six to ten days later in the year. Immediately individual plants are distinguishable, any excess population should be removed to secure as far as possible an even distribution of those remaining in the bed. Weeds should be kept in check, as these flourish at the expense of the tobacco seedling. If the beds are sown under hessian, this covering, when the plants are firmly established, should be removed daily for gradually lengthening periods until the plants are sufficiently hardy to dispense altogether with this protection.

If indications point to the occurrence of a late frost, the seed-beds should be given a protective covering of some form—straw being a suitable medium for this purpose. In removing any covering provided, due care must be taken not to injure the young plants.

The frequency and time of watering cannot be arbitrarily stated, but must be governed entirely by local conditions, the object always being the maintenance of uniformly moist conditions within the bed.

To avoid the attacks of caterpillar pests, especially the larvae of the potato moth, spraying of the seed-bed three weeks after germination is recommended. One pound of arsenate of lead dissolved in 30 gallons of water makes a suitable spray. As the seedling becomes stronger, the strength of this mixture can be increased to 1 lb. of arsenate of lead to 20 gallons of water. Spraying should be carried out after watering, and in the event of rain immediately following should be repeated.

[*Further articles on the establishment and care of the crop, harvesting, curing, grading, etc., will appear in subsequent issues of the Journal.*]

A Hessian-covered Seed-bed

Perennial Rye Grass Seed

Harvesting Methods

By E. D. Cameron B.Agr.Sc. Assistant Agrostologist.

POSSIBILITIES for the expansion of the grass seed industry in Victoria are considerable. At present, in the Western districts of the State, from 600 to 2,000 acres of perennial rye grass are harvested each year, but the quantity produced is only a small portion of our requirements, and large importations take place annually. The annual fluctuations in acreage result from the varying seasonal requirements of the grower for pasture for his stock. According as the season is a flush one or otherwise, the areas allowed to go to the seeding stage are greater or less.

Those who have used Victorian-grown seed generally have had very favorable results and, because of their experience, the Western District seed has obtained a reputation for permanence over a period of years. Consequently there is a good demand for this seed, and apart from sales to seed merchants much of it is being distributed direct by many growers whose seed has an established reputation in certain localities throughout the State for the excellence of the permanent pasture obtained.

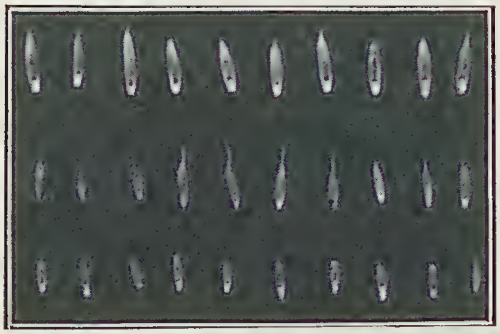
An important factor governing the percentage germination is the care and judgment used in harvesting the seed, and it is the purpose of this article to put forward certain information and suggestions on harvesting methods.

In many areas in our better rainfall districts, notably the Western District, Central Victoria, and Gippsland, there are fields whose dominant pasturage is rye grass (*Lolium perenne*), and many of these might be profitably used to obtain a crop of seed in years when the spring growth of grass is overabundant for the needs of the stock. The extent to which this is done at present is relatively small, and many farmers might find it profitable to undertake the work as a side line to their present system of farming, and even to develop it into a major operation.

One of the main difficulties encountered by growers is that complete removal of all the seeds in the "head" is not possible at the time of harvest, because the head matures unevenly, the top seeds being ripe, while those at the base are still immature. When the seeds at the base of the head are ripe those at the top will have fallen or would easily be shed on shaking by wind or rain. Just before this stage has been reached is the best time to harvest, as then the ripe top seeds are all saved, and many of the lower ones are sufficiently forward to mature into plump germinable seeds if the curing process is carried out properly. The method generally adopted to ascertain whether the crop is ready for stripping is to rub the heads gently between the hands. If the seeds in the upper portion of the heads rub out easily and are ripe and mature, then the field is regarded as ready for stripping. The time of harvest may be expected to vary somewhat from district to district according to climate, the earliness or lateness of the season, and whether the field was closed early or late. As a general rule, however, the field will be ready to harvest in late December or early January, immediately after two or three hot "ripening" days.

Methods of harvesting rye grass seed have advanced as the cereal harvesting machines have improved. The box-stripper was used extensively for harvesting rye grass seed until a few years ago, when it was superseded, in many cases, by the stripper-harvester. If the box-stripper is used for harvesting, the contents of the box are emptied on to a coarse wire-netting riddle table ($\frac{1}{2}$ inch to $\frac{3}{4}$ inch mesh, and oftentimes home made) to remove the long straws and coarse rubbish. The removal of this material is important, as it considerably reduces the bulk to be handled in subsequent operations and remedies a tendency to produce uneven drying or curing, which may occur if the long green straw is present, with the risk of a "fusty" sample resulting. The seed falls through the riddle table on to a hessian or tarpaulin sheet below until a depth of from 3 to 4 inches is obtained.

The table is then moved a little further along and the operation repeated. The seed is left on the hessian or tarpaulin sheet to dry in the field.



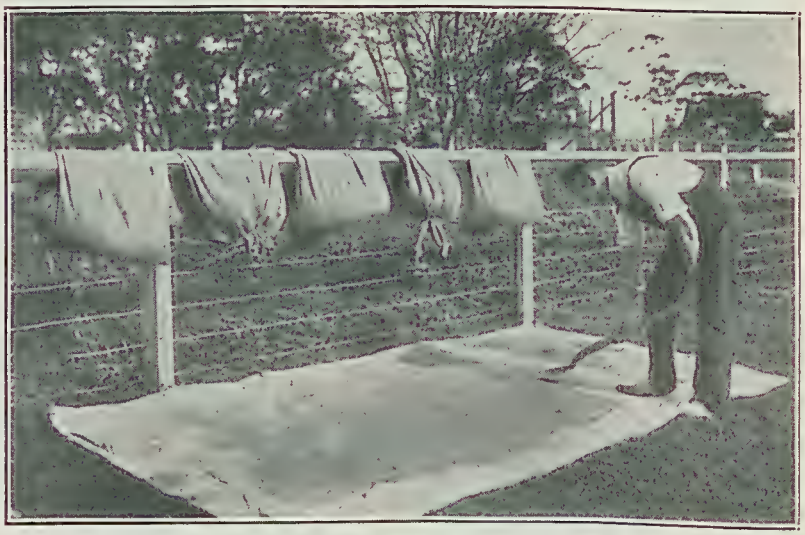
Seeds of Wimmera rye grass (top), Italian rye grass (middle), and perennial rye grass (bottom), showing comparative sizes.

NOTE.—The awns on the Italian rye grass usually are broken off during clearing operations.

Thorough and even drying of the sample is essential to obtain a clean, hard, bright seed which is readily saleable, easy to handle, and likely to give satisfactory germination when sown. In order to secure this, the seed is turned by forking at least two or three times daily or more often according to the weather, the greenness of the sample, and the amount of heat being generated. If fine weather prevails drying occupies two or three days, but under unfavorable conditions it may be several days longer before the material is ready to be bagged and stacked on a dry impervious floor to await a convenient time for winnowing. The work of turning the seed on the tarpaulin two or three times a day is often inconvenient and sometimes neglected, with the result that the percentage of germinable seed may be greatly reduced.

An alternative curing method, which is practised in New Zealand and elsewhere with excellent results and which involves less subsequent labour might, with advantage, be more generally adopted here. There appears to be every reason for the method being equally successful here, and under damp soil conditions it should prove superior to the method at present practised. After passing through the riddle table the seed is placed in chaff bags which are filled one-third full or less, tied at the mouth, and slung saddle fashion over a wooden fence. The bags may be shaken occasionally with advantage. The circulation of air around the bags under this method has a considerably greater influence on the curing than when the seed is left lying on a tarpaulin on the ground, which may be damp, and will communicate its moisture to the seed. Since the dissipation of heat and the drying of the seed both depend on the free circulation of air, the advantages of this method will be readily apparent.

The winnower in general use is the ordinary hand-box winnower fitted with two zinc plate riddles, the upper one having circular holes five-sixteenths and the lower three-sixteenths of an inch in diameter. The top riddle removes short pieces of straw, sticks, and other rubbish. The rye grass seed drops through on to the second riddle, which removes to a large extent, but not completely, foreign seeds such as hair grass, goose grass, rib grass, and clovers. Such seeds as these are very difficult to remove completely, but by very careful and tedious winnowing a fair sample may be obtained. The seeds of rib grass (*Plantago lanceolata*) are the most difficult to remove, and fields containing much of this plant should



Two methods of drying perennial rye grass seed. In the foreground is the seed spread on a tarpaulin and being turned occasionally. Behind are seen butts of seed hung saddle-wise over a fence.

not be kept for seed harvesting. The cleaned seed passing from the winnower is bagged immediately. The bags when full weigh from 80 to 105 lb., according to the bushel weight of the seed, which depends on the length of time the field has been closed to stock, the weather at the time of ripening, and the freedom from weeds and foreign matter.

More elaborate and expensive machinery than any farmer can reasonably afford is required to prepare a very clean attractive sample, but the outlay would be well within the scope of each rye grass growing community if the outfit could be purchased and run as a co-operative effort. In view of the enhanced price obtainable for a clean attractive sample, it should be both profitable and economical to establish a central seed cleaning plant in each principal rye-grass area. A small charge to meet running costs and depreciation could be made for the use of the plant. Each farmer's seed could be returned to him for private sale if desired, or it could be despatched direct from the plant to the purchaser. An alternative plan would be the formation of an association which would own and run the plant. and dispose of the seed from that area under a special name on behalf of its members.

The total cost of a power-driven seed cleaning plant with a capacity of 15 bushels per hour is estimated at from £200 to £250. A plant of this size would meet the requirements of most districts, though a larger one might be necessary in some rye-grass growing areas as the industry expanded.

The reaper and binder is sometimes used on farms where the harvesting of seed is not a regular practice, but where a heavy crop occasionally appears in a good season and this machine is the only one available. The field is cut just before the seed is fully ripe, when it will remain in the head, and withstand the shaking involved without "shedding." After cutting it is stooked, and, when dry, put through the threshing machine, and subsequently winnowed.

The stripper-harvester, as used for wheat, is displacing both the box stripper and the reaper and binder in districts where harvesting for seed has become a regular farm practice. This machine is used exactly as for wheat, but as soon as harvested the seed is spread out on a hessian or tarpaulin sheet, or slung in bags over a fence as previously described in the method of harvesting with the box stripper. The winnowing may be done either with the hand winnower as already described, or by passing the seed through the stripper-harvester a second time, which is then driven by mechanical power, a belt operating on a pulley attached to the spindle of the peg drum. The seed is fed into the peg drum, and from there it goes through the riddles, and finally into the grain box, from which it is bagged. This method is probably the more economical, but it is doubtful whether the seed is cleaned as thoroughly as by the hand-winnowing process. Some manufacturers provide a separate set of riddles for rye grass seed for use with the stripper-harvester. These improve somewhat the sample of seed produced.

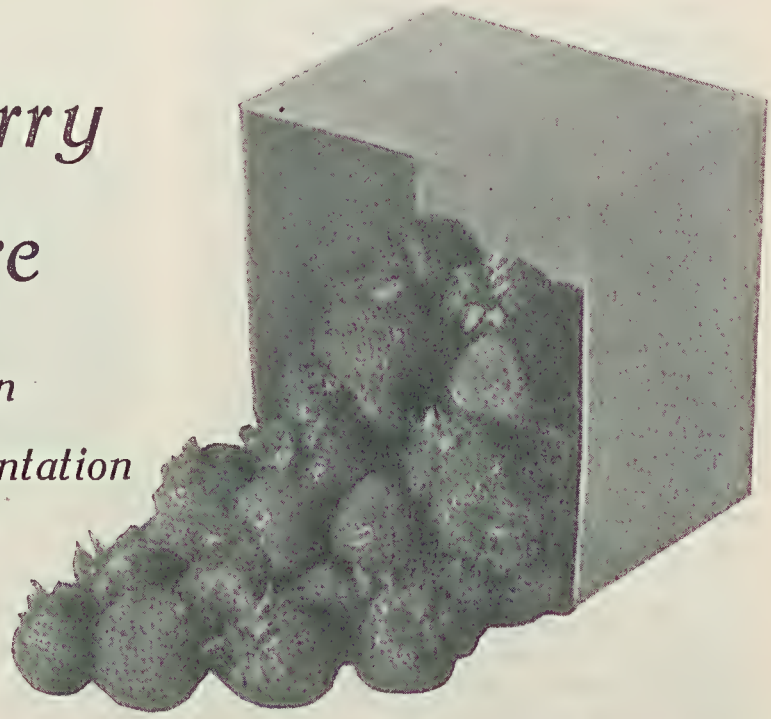
In connexion with the use of the stripper-harvester, as also in the case of the box stripper, the spacing of the teeth of the comb is important. If the space at the base of the teeth is narrow (say less than ¼ inch), there is the possibility of clogging. Another point of importance is the necessity of driving into the wind when harvesting has to be conducted on a windy day. If driven into the wind the machine will protect the riddles, whereas if driven with the wind the seed will bank up, and the riddles soon become overloaded, necessitating constant stopping and levelling of the seed.

A third factor of importance when a horse-drawn ground wheel-driven machine is being used is that of the speed at which it moves. The speed of the mechanism varies in direct ratio to the varying speeds of the horse team. At slow speeds the heads are poorly stripped, and much seed is lost, while at high speeds an excessive amount of straw is collected and passed into the box. Varying speeds also give rise to poor threshing and winnowing. In this latter operation the efficiency of the riddles depends to a large extent on an optimum constant flow of seed on to them. A uniform speed of from 2½ to 3 miles per hour gives the most effective stripping and the best sample of seed. The advantage of a horse-drawn engine-functioned machine in which the mechanism is under independent control will be apparent, but it is very doubtful whether any but large scale growers will find its use an economical proposition.

Whatever the method of harvesting found most convenient, the drying or curing process must be undertaken immediately, and carried out carefully and thoroughly. This is the critical operation in obtaining an attractive saleable sample of perennial rye grass seed that will give satisfaction to the purchaser.

Strawberry Culture

II.—Maintaining an Established Plantation



By

A. G. Strickland, M.Agr.Sc., Horticultural Research Officer.

[*The first article of this series, which was published in the July issue of this Journal, outlined the factors involved in the establishment of a strawberry plantation.*]

Working during the First Season.

Cultivation.

As soon as weeds germinate the horse-hoe should be used. Tillage to a depth of about 4 inches is desirable, provided that the implement does not come within 9 inches of the plants on either side. Between plants in rows hand-hoeing is necessary; this should be shallow, from 1 to 1½ inches being sufficient to prevent roots coming too near the surface. Care should be taken not to cut too many roots of the young plants, and this cleaning process should be repeated as often as the season demands. During the first summer after the crop is harvested frequent cultivation with the scarifier (small Planet Junior) should be carried out.

Runners.

After the plant is established, it sends out runners which produce new plants, and in the matted-row system several runners are allowed to form new plants during the first year. In the hill system, however, which is most common in Victoria, all runners are removed throughout the season as they retard the growth of the parent plant. Where it is desired to obtain new plants, a sufficient number of first-year plants should be set aside for this purpose. From these plants, flower stems should be removed as they appear, production of flowers and fruit at this stage tending to decrease the production of runners. As soon as the runner has taken root, and before it extends its stem for the production of further runners, detach it from the parent plant, and pot it in moist earth rich in vegetable mould. Pots should be kept in a cool, shady place, and watered regularly until planting time in autumn. The practice of allowing runners to attach to the parent plant until required for planting out, or of even detaching them and leaving them in their original position in the ground throughout the summer is not to be commended. The runner is weakened by subsequent runners extending from it, and by exposure to sun and drought. Plants produced early in the season are superior to those produced in late summer months, as the crowns of the latter are not sufficiently matured. The practice of re-

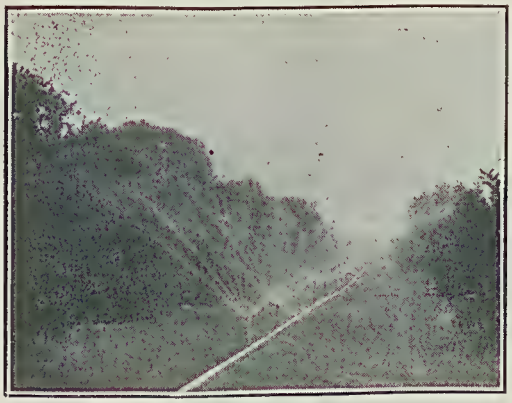
moving spring flowers, to stimulate runner production, is advised where it is desired to obtain young plants for a fresh plot.

Mulching.

The practice of mulching is to be recommended, and many materials are satisfactory for the purpose, oat, wheat, or barley straw commonly being used. The material should be applied shortly after the setting of the earliest berries, and should cover the ground surface, including the area under the leaves of every plant. The quantity of straw required to mulch one acre is approximately 15 cwt. to 1 ton. Mulching prevents the splashing of berries with dirt, and the cost is justified by the higher proportion of clean berries harvested.

Irrigation.

Strawberries being comparatively shallow-rooted, the yield and quality of the crop in



Spray Irrigation.

southern Victoria is often diminished to a greater or less extent by periods of drought previous to, or during the fruiting season. Under such conditions one or more irrigations will prevent loss which might occur, and in hot, dry weather may even be the means of saving the crop. In the north of Victoria the crop will, of course, require frequent irrigation, and a good practice is to water every two or three weeks during the early part of the season, and then at more frequent intervals during the hotter portion of the growing period. Water should be applied weekly in the summer, and in the autumn sufficient water should be applied at intervals to keep the plants growing up to the break in the weather. The method of applying water is similar to that used in tomato culture, either by means of permanent ditches between rows (as in raised bed culture), or by means of furrows on one or both sides of the row, where level culture is practised. If the outlay is justified, the installation of an overhead sprinkling system simplifies the irrigation question, as this method of watering gives the grower complete control over soil moisture.

During the picking season irrigation should follow picking. There is some danger in applying water too freely, as it may lead to the production of soft, poor quality fruit. The aim of the irrigator should be to give the plants sufficient moisture for their needs only, and not to attempt to force a large crop of soft fruit by over-irrigation.

Harvesting.

The number of pickings is controlled by the weather. Generally speaking, the fields should be picked over every other day, but if the weather is hot and the berries are ripening rapidly, it may be necessary to pick daily. The fruit will carry better if picked during the early part of the day, whilst it is still firm and cool.

The berries should be harvested when they are from three-quarters to totally red, and no variety should be picked with the tips still green. The fruit is not pulled or stripped from the plants, but pinched off by the stem, leaving about ½ inch of stem still attached. Each picker should be provided with a shallow wooden tray designed to hold four 16-18-oz. punnets, into which the fruit is placed. Subsequently the fruit may be graded according to size and quality, the usual grades being Special, No. 1, and No. 2.

For some trades the punnets are faced in order to make them more attractive; this is done by turning the berries on their sides so as to show as little of the hull as possible. It is important to remember, however, that the top layer must represent a fair sample of the contents of the punnet. For small round-berried varieties, facing by means of placing the fruit in rows, with the stem ends down, will be found to provide the most attractive pack.

Punnets are packed into crates, holding 24, 32, or 40 punnets, according to their size, a movable shelf separating each layer of boxes.

In order to comply with packing regulations punnets must be of the following dimensions (inside measurements):—Width at top, 4½ inches; width at bottom, 4 inches; depth, 2¾ inches.

Fruit should be handled as little as possible and kept out of the sun; for this reason picking trays holding more than four punnets are undesirable. Closest attention should be paid

Renovating an old strawberry patch. 1.—The rows are narrowed down by ploughing through the centre.

to packing and grading, and all soiled and under-sized fruit removed from the first grade. Medium to large berries of good colour, and not over-ripe, bring higher prices than fruit of all sizes, especially if the latter is shrivelled or mushy.

Renewal of Plantations.

The life of a plantation depends largely on the prevalence of weeds, insect pests, and diseases, and to a lesser extent on the variety, system of training, and soil preparation prior to planting. Generally speaking, it does not pay to maintain a plantation for more than two or three years, and it is sound practice to establish new plantations progressively to replace older ones as they run out.

2.—After ploughing the rows, the land between the rows is hoed to turn up the old plants.

If a second crop is to be harvested, renovation of the old bed is necessary, in order that strong new growth may be obtained. Old and diseased foliage is a menace to the future welfare of the plantation, and must be removed. After removing most of the previous season's mulch, it is often the practice to mow the plot with the mower blades set high enough to cut weeds, and much of the strawberry foliage, without injuring the crowns. When the rubbish thus obtained is in good burning condition, a fire is applied on the windward side. A moderately windy day should be chosen for this purpose, as it is desirable that the fire should traverse the patch very quickly.

The space between rows is cleared of runners by several cultivations, and rooted runners in the rows are thinned out. Where old crowns are of weakly appearance, healthy runner

3.—The plants are next thinned in the row and the debris raked up and burned.

plants may be used to replace them. Application of stable manure should be made during winter, spreading over the inter-row space and well up to or even over crowns, provided that the manure is well rotted. Any application of artificial fertilizers should be made in early spring.

Varieties.

The selection of suitable varieties is one of the main factors governing success in strawberry culture. Generally speaking, it is best to select those varieties most largely grown in the district, as they are probably best adapted to the climatic and soil conditions prevailing in that particular locality. It is also advisable to limit the number of varieties grown to as few as possible. Some varieties are pistillate (no pollen), or poor pollen bearers, and must of necessity be interplanted with another pollen producing kind. If the

fruit is to be grown largely for the dessert trade different varieties will be grown to those adapted for factory berries. Colour and size of fruit are important, and texture even more so. A good firm variety will arrive on the market in good condition, even if several days elapse before it is sold. Other factors worthy of full consideration are resistance to disease, time of ripening, flavour, &c. The following are some of the more important varieties:—

Melba.—A very prolific cropper which responds well under irrigated conditions in southern and northern Victoria. The fruit is large, brilliant red, and good crops are borne right up to late autumn.

Sunbeam.—This variety withstands drought well, and also gives excellent results under irrigation. Fruit is borne compactly, near the centre of the plant, thereby ensuring protection by the foliage from scorching sun. The fruit is rounded, dull red in colour, and of excellent flavour. The flesh is firm, and the variety is therefore a good "carrier." In a favourable season it bears well from late October up to the middle of February without the aid of irrigation.

La Marguerite.—The berries have a particularly fine appearance, being large and brilliant in colour, but the flavour is not so good as that of other varieties. This variety bears a large proportion of pistillate or imperfect blossoms, and to ensure good setting of fruit it is necessary to interplant with a good staminate variety.

Illawarra.—A very vigorous plant, coming into bearing early, and, provided that runners are kept down, bearing until late in the season. Fruit is of a fine red colour, large, and of excellent flavour.

King Edward VII.—The fruit is rounded, of rich flavour, dark-red in colour, and fairly firm in texture. It is a vigorous variety, and being staminate sets freely without interpollination.

Ettersburgh.—Fruit hangs in bunches well clear of the soil and ripens very evenly. Flavour is good, and the flesh very firm. This fairly vigorous variety does best on rich soils, and is one of the best for jam-making or canning.

Leura.—A strong-growing variety, bearing good crops of medium-sized berries with a distinctive flavour.

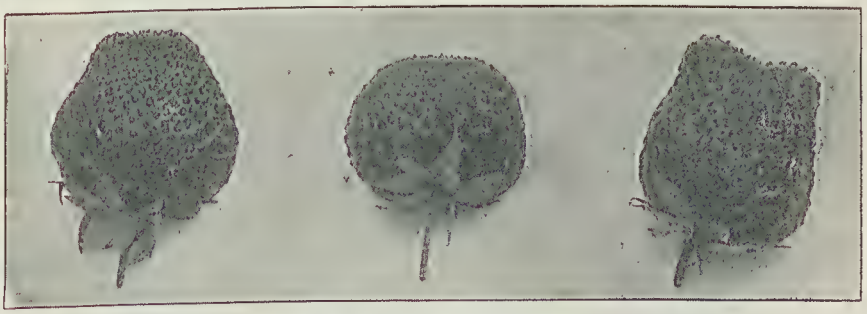
Creswell's Seedling.—A standard variety in New South Wales, producing fruit of excellent colour, flavour, and texture. It is a heavy cropper, and bears, in favoured districts, from November to June.

Rhode's Special.—A good commercial berry, which is reputed to be an improved Up to Date or Melba. The colour is rather a pale pink, and the texture not of the best.

Wilson's Pride.—This variety is most favoured in the Melbourne district. It is not such a good carrier as Melba, but bears heavily in this locality, and when grown moderately close to the market is very profitable.

Several strawberry varieties were imported from England in 1929, including Royal Sovereign, Bedford Champion, and Scarlet Queen. Bedford Champion has performed well in tests carried out at the Horticultural Gardens, Burnley, and also at Red Hill. It makes a compact plant, bearing heavy crops of dark-red fruit. The flesh is soft in texture, however, and it is therefore a bad carrier. Scarlet Queen also shows promise, but is inferior to Bedford Champion.

[*A further article will deal with fungus diseases and insect pests of the strawberry.*]



Varieties of Strawberries.

Reading from left to right—Melba, Sunbean, Royal Sovereign.

Leaf Scorch of Fruit Trees

By

Frank M. Read, M.Agr.Sc.,
Senior Horticultural Research Officer.

A Rome Beauty tree severely affected with Leaf Scorch on half its branches.

DURING the growing season just past, scorching of the leaves of deciduous trees in certain localities has been very serious, while in a large number of centres, though not very serious, it has been bad enough to warrant attention.

This scorching has developed as a browning and drying out of the margins of the leaves. In bad cases only a small area of the centre of the leaf remains green, the remainder being brown and shrivelled. The tree so affected resembles one which has been severely scorched by a fire. Many observant growers have commented on the fact that such injury has been more prevalent in the very wet year through which we have passed than ever before, whereas they would have expected to notice more leaf scorching in a hot dry year.

The trouble has been attributed in many quarters to spray injury, and, in particular, to the quality of the water used in the spray mixtures. Of course, some spray injury may have been caused on a few orchards, but most of the leaf scorch which appeared in Victoria last year was not due to such a cause. Although in this State, in normal seasons, we do not suffer much in this way, English apple-growers have learned to look on Leaf Scorch of their trees as one of their major problems. It is to England, therefore, that we turn for information. Wallace, of the Long Ashton Research Station, Bristol, has done notable work in this direction. Laboratory experiments on bush fruits, and apple trees grown in pots of sand and watered with nutrient solutions of various composition, indicated to him that leaf scorching of the type described was associated with the nutrition of the plant. It was determined that, under conditions such as these, deficiency in potash was largely responsible, and, when abundant nitrogen accompanied the lack of potash, scorching became very much worse. Wallace's

Leaf Scorching of Jonathan apples causing very scanty foliage.

laboratory experiments have since been extended to the field, where they have found verification and have met with the most encouraging success.

While it is not possible to state that the results obtained in England will be reproduced under our local conditions, it is reasonable to suppose that their experiences will be helpful to us. In the absence of sufficient local information, therefore, the following remarks and recommendations are based on the experiments of the English workers.

Three types of soil are particularly conducive to scorch:—

1. Very light sandy soils, prone to drying out;
2. Shallow soils overlying an impervious subsoil; and
3. Water-logged soils needing drainage.

It will be seen that in each of these cases faulty water supply to the tree would ensue. The first two soils would tend to dry out in a hot spell of weather, and the third, by restricting the root system, would also limit the amount of water absorbed by the roots. Scorching has been associated with these three types in Victoria this year, but, in addition, severe injury was experienced at Bacchus Marsh under soil conditions which do not readily fall under these headings.

Many growers have been surprised to see leaf scorch in such a phenomenally wet year, but there are very good experimental grounds for supposing that heavy and continuous rains will encourage this condition. It has been demonstrated that, if a leaf be placed in a vessel of water for a short time, a considerable quantity of minerals, including potash, will be dissolved out of the leaf. The excessive summer rains in Victoria this year undoubtedly have leached much potash from the foliage, and accentuated the trouble.

In one instance with which I am familiar—a Beaconsfield orchard—severe scorch immediately followed the very heavy December rains. For this reason it is possible that, in normal years, many of the orchards affected this year will not suffer. There are, however, a number which have shown these symptoms for some years past, and on these action should not be delayed further.

It is recommended that where leaf scorching is appreciable, fairly heavy potash manuring should be carried out for three or four years, or until such time as the trouble disappears. This can be done by applying potash either in the form of sulphate or muriate (the latter is the cheaper at the present time), at the rate of 3 or 4 lb. per tree. This dressing should be applied preferably towards the end of August each year.

On orchards not seriously affected, a dressing of potash at the rate of 1 lb. per tree each year probably will suffice, and in those cases where the heavy dressing is given for a few years 1 lb. per tree may be sufficient after the trouble has been largely eliminated. Each grower must judge his own case for himself, but my view is that he should be generous with his potash for a year or so, and not be discouraged by a delayed response. When he has secured his response, however, he might well try much smaller annual applications of fertilizer.

It has been mentioned that high soil nitrogen seems to accentuate potash deficiency, and experiments have shown that the balance between nitrogen and potash in the plant is very important. Obviously, then, heavy nitrogen manuring on trees affected with Leaf Scorch should be avoided.

On experimental plots at Beaconsfield this year, it was noticeable that on those fertilized with sulphate of ammonia (3 lb. per tree) scorching was more severe than on those which received potash, at the same rate, in addition to the nitrogen, while on the plots receiving potash only, scorching was practically absent. On rich soils high in nitrogen, it may be necessary to lower that nitrogen by allowing weeds, &c., to grow, instead of practising the usual clean cultivation.

In this country we are apt to believe that under no other system than clean cultivation could an orchard be successfully carried on. There are, however, parts of the world in which an orchard cannot be efficiently managed under clean cultivation, and sod culture has to be resorted to.

It is conceivable that under certain conditions, and in certain years, clean cultivation is not the best system of orchard management in Victoria. In a wet year, like the last, especially when Leaf Scorch was apparent, I consider that to allow the natural herbage to grow unchecked was often an advantage; and clean cultivation, even though it did no harm, was, in many instances, a waste of time. In a dry year, of course, when moisture is a limiting factor, the position is radically different.

Let us hope that in the season ahead Leaf Scorch will be scarce. If it should appear, however, I would be grateful if orchardists would keep an accurate record of it and notify this Department.

Junior Stock Clubs

Calf-Club Work

A Means of Educating Future Stock Breeders

By J. W. Yuill, Senior Dairy Supervisor.

Five McIvor sisters—members of the Boolarra Calf Club.

EDUCATIONAL facilities for the training of the future artisan are available in most of the large cities of the State, but very little effort has been made to teach future stock-owners the rudiments of the occupation for which they are intended. The Junior Stock Club movement, however, is making a laudable effort to supply this want. In other parts of the world, particularly in America and Canada, work of this nature is carried on under various names, such as "Boys and Girls Clubs," "4 H Clubs," and "Future Farmers' Leagues," and in England and New Zealand there are similar organizations. In New South Wales and in Queensland there are many children's clubs, the most popular of which appear to be those devoted to rearing calves and pigs. In South Australia the clubs are known as "Home Product Clubs."

In Victoria during the war period the testing of cows and the fattening of pigs were carried out by the scholars of the Dollar State School under the guidance of Mr. A. Savige. The children were induced to weigh daily the milk of one or more of the herd cows, and to make monthly tests at the school. A complete record was shown at the end of the year, and those who had taken part in the experiment were asked to write an essay on the Babcock test, and to give a detailed record of the year's test work. The experiments in pig fattening work began with the purchase of a farm pig, and ended with a complete balance-sheet, which showed all expenditure and receipts. More recently pasture plots and poultry clubs have been established in some centres.

Whatever the form of club, whether stock or otherwise, the underlying principle of the work is the same, viz., to interest and educate the growing boys and girls—the farming folk of to-morrow. There are, however, definite and distinct fields of operations. A laudable feature of the "Home Product Club" work is the teaching of improved farm practice by utilizing the available farm stock and feeding them under approved systems. All costs for stock and food are kept by an approved system of bookkeeping, and thus club members are taught to associate business principles with commercial farm practice.

Calf-Club Work.

Of the many forms of club work, that of the Calf Clubs is the most popular. These

clubs are generally organized in the State schools of the dairying areas. The Geelong Gala Calf Club was formed in 1917 by Mr. A. Griffiths, following a visit to America. It is still in existence, and it is claimed that as a result of its activities there are 200 head of pure-bred stock in the district. This club, which began with a few "gift" calves, is controlled by a few simple rules, one of which provides that a gift calf must be made to the club by each person to whom a "gift" animal is allotted. In this way the club provides its own calves for further distribution.

In addition to the Gala Calf Club at Geelong and the Rotary Club at Ballarat, there are many clubs in Victoria, particularly in Gippsland. During the two years of its existence the Sunny Creek Club has distributed £550 worth of pure-bred calves to its 36 members.

Clubs were organized at Yinnar South and Dollar in 1922, and at Pomborneit, Boca, and Archie's Creek during the following year. Two years later, clubs were formed in the Upper Murray district, at Corryong, Walwa, Granya and Tallangatta. Several clubs have been established in the Central Gippsland area, including those at Yarragon, Lardner, and Ellenbank, while others have been formed at Stanhope and Trafalgar West.

During 1930, clubs were started at Kardella, Coalville, Wardale, Foster, Bennison, Ballendella, Sale, and at Boolarra, while strong clubs are being built up at Pakenham, Woodleigh, and Winchelsea. In more than half of these clubs, pure stock only is handled; in the remainder, which are larger clubs, grade or unregistered stock are reared and bred from.

Mary Dalglish—an enthusiastic member of the Sunny Creek Calf Club.

There are at present approximately 300 pure-bred, and 170 grade animals in the various calf clubs. If the pure-bred calves be valued at an average of £10 10s. each, it will be seen that approximately £3,000 worth of pure-bred stock is now owned by club members. This estimate is probably on the low side, for some of the animals are valued at high sums.

There is a considerable variation in the working of clubs, even among those which handle only pure-bred calves. In some instances, all the calves are obtained through the

Members of the Kardella Club at the Warragul Show.

clubs, sometimes they are purchased outright by parents for their children; in yet other cases the calves with which to commence a club are received as gifts.

Leo O'Sullivan—a member of the Bennison Calf Club, with his calf which gained first prize at the Foster Show.

Breeders of pure-bred stock can hardly be expected to supply the ever increasing demand for gift calves. Indeed, some club leaders have found it difficult even to purchase the stock necessary to start a club. A leading breeder recently informed me that he had had nearly twenty inquiries for calves, but unfortunately had none to sell. In at least one district the formation of a club has had to be deferred owing to the difficulty in obtaining calves.

Most breeders require their best female stock for herd building, and low quality calves are not wanted for Calf Club work, for nothing will do the movement more harm than the rearing of poor producers. It is to be hoped breeders of pure stock will recognize that selling a low quality animal cheaply may turn out to be a bad advertisement. There are two leading causes preventing the more rapid development of Calf Club work. One is the diffidence on the part of parents to sign the necessary guarantees on behalf of the juvenile member; the other is the difficulty in securing good quality pure calves.

Education the Feature of Club Work.

It should be kept in mind always that the great value of Calf Club work lies in the spread of knowledge concerning the principles of breeding and feeding and the care and management of live stock generally.

The mere ownership of pure stock is not sufficient. It is not so much the multiplication of pure stock breeders that is needed as the inculcation of the need for better stock, together with a sounder knowledge of farming practice.

Organizing a Calf Club.

The calves used may vary from registered pure-breds to grades, according to the type of club. Female calves are, of course, most sought after, although young bulls would be very acceptable to some clubs. In the junior clubs, or section of a club, the small children are catered for by the "loan" of a calf for a period of between six and nine months. This arrangement continues until the child is old enough to own and handle a strong animal.

In "gift" Calf Clubs the only obligation of a member who has received a calf is to supply his club with one of the female progeny of the animal with which he was presented. In other clubs, where the child receives a calf through the funds of a club, he must begin

Joyce Hobley and Bonnie Brydon—members of the Kardella Club.

repayments when the animal comes into profit as a milker. In those clubs where a parent purchases a calf for his child, there is, of course, no monetary obligation on the part of the child to the club. In practically all clubs the child member becomes the definite owner of the calf.

Wherever there has been any desire to start a club, there has not been any difficulty in securing money for the purpose. This is mainly because young cattle "grow into money," or, in other words, if a calf is well bought, it must increase in value as it matures. The Primary Producers Bank and other trading banks have been prepared to make reasonable advances to enable a club to make a beginning, subject to the usual business safeguards being given.

Members of the Yarragon Calf Club.

Pure Breed Clubs the Ideal.

Wherever possible, clubs should handle pure-bred stock. There is, however, no good reason why a grade calf club should not be formed when the parents are not disposed to guarantee the child's purchase of a pure-bred calf. There are some splendid clubs of this kind operating in Victoria. The majority of the animals used are high grade, "unregistered pure" appendix stock, and the "marked calves" from the proved producers of the Herd Test Association. There is still a fairly common belief that pure-bred animals lack hardiness, or that they will not produce profitably under commercial dairy farm conditions. For these reasons, and because of the higher cost, many parents do not avail themselves of the opportunity of securing for their child a pure-bred calf.

On the other hand, some people do not think a club worth while unless its stock is pure-bred. This is a narrow view. Splendid grade clubs have been organized where it was found quite impossible to inaugurate a pure breed club.

The all-important office in a juvenile club of any kind is that of club leader. This is particularly true of calf club work. The ideal person is one possessing that rare combination of tact, a knowledge of the work, an enthusiasm which he can retain and impart to others, particularly to club members and their parents. Many people would gladly work for children, but they have not the qualities that fit them for the task.

Some schoolmasters appear to possess these traits in a rare degree, and what they lack in practical farm knowledge is made good by enlisting the aid of some enthusiastic district breeder. Sometimes a retired farmer finds an outlet for his energies, as at Yarragon, where Mr. F. S. Bailey has made an excellent club leader, or at Yinnar South, where Mr. Walker, a successful farmer and breeder, is the Calf Club leader.

Club Activities.

The club leader, or his deputy, makes periodical visits to the farm, where members' stock are inspected, necessary advice given, and points awarded for care and attention.

Club Shows bring all the members of the club and their calves together for competitive comparison. On these occasions, judging competitions are arranged, lectures are given on conformation, and the good and bad points

are made known. It is evident from the score-cards returned by these "junior farmers," that many possess a keen aptitude for observation.

The Pomborneit Club recently visited the farms of Mr. K. McGarvie, and the Messrs. Brisbane Bros.' Gowrie Park stud; at each place interesting and instructive addresses were given by the owners. Several car-loads of members of the Yarragon Club visited the farm of Mr. T. Mapleston, at Jindivick. This farm is noted not only for its stock, but also for its high degree of sanitation and good management.

Recently, Mr. Martin, the manager of the Trafalgar Milk Supply Company, gave an "open house" to the members of the Yarragon Club. Each operator in the factory explained his particular task to a keen band of "junior farmer" enthusiasts. Many district farmers do not know as much of the manufacturing side of the industry, as these embryo farmers do now.

The club leader arranges for lectures by Departmental officers on feeding, care and management of stock, or some other phase of the work. Members take notes at these lectures, and later write an essay on the subject; this greatly helps to fix facts in their minds. Some clubs are now organizing pasture plots and fertilizer trials, together with comparative trials of grass species.

In addition to the Club Shows, sections for Calf Club exhibits are now included at a number of provincial shows, and several club members have been successful in the open sections. The special club sections provide for inter-club competitions.

At the 1931 Royal Show in Melbourne, classes are provided for yearling heifers of the Jersey, Ayrshire, and Red Poll breeds. In each instance there are three prizes. First, £3 3s.; second, £2 2s.; and third, £1 1s. The heifers must be the property of a Calf Club member. The Victorian Railways Commissioners have shown their interest in the movement by arranging for reduced freights for exhibits, and fares for members journeying to the Royal Show, and for stock purchased by club members.

There appears to be a prevailing idea that club calves will be registered free by the various breed societies. It is true that the breed societies are showing commendable interest in the movement; in that they are accepting the clubs as members of the Breed Society, and by so doing are making a donation of the annual fee of £2 2s. Certain requirements, however, must be complied with, viz., that each club shall appoint for each breed a representative who is acceptable to the society for that breed. He must undertake to notify births of calves, to tattoo the animals, and in all other respects to see that the rules of the society are complied with as far as they relate to the Calf Club's stock. Really, he accepts the responsibility for them in the same way as he would for his own pure herd. Mr. Louis Monod, Temple Court, Collins-street, Melbourne, is the secretary of the Pure Breed Societies, and club secretaries should get in touch with him if in doubt on any phase of registering club stock.

Calf Club Shows.

There is considerable difference between the judging at a Calf Club Show and the usual method of judging calves. Every effort is made to give full recognition to each member's work as well as to the exhibit. In the show-ring the prize will be awarded to the most typical specimen of the breed according to the judge's opinion. As the breed quality and conformation of the calf will reflect the ability of the breeder, it will be seen that the club member enters into the picture to a very limited degree. Luck when the calves are allotted may be the only factor needed to give a champion calf to one member, and the lowest-scoring animal to another. To get over this difficulty, a system has been devised that has given satisfaction wherever it has been tried. This is to allot one half of the aggregate points for breed type, the other half to be allotted for care, method of keeping accounts, &c. This system is suitable for all classes of clubs. Grade calves can be judged on dairy type, and pure breeds on their respective breed type and conformation.

Scale of Points for Club Judging.

	Points.
Pure breed type (or dairy type)	50
Appearance and age development	20
Leading and ringcraft	15
Bookkeeping	15
Total points	100

It will be seen that half the points are awarded for the actual work of the child, while full scope is given for the judge to place each animal according to breed excellence. A member may be fortunate enough to be allotted the

most typical calf and take first place in his section, yet fail to win the club aggregate ribbon because of indifferent bookkeeping, or failure to train his calf so that it will lead attractively, or to prepare his exhibit thoroughly. A member may be beaten for first place by four different members, and still win the aggregate ribbon with four second placings.

A system of awards under which each competitor receives some amount is strongly recommended. This object can be achieved by simply dividing the total prize money by the total points of all competitors, or else by awarding each competitor 1d. (or whatever amount be decided) per point. At a recent show, the winner scored 94 points, while the lowest score was 53 points. The prize money was allotted on the basis of 1d. per point, each section winner received a ribbon, while the champion calf-owner received the aggregate ribbon. Under this system, reward is made possible for the good work of every member.

It must be remembered that it is during the feeding, leading, grooming, and attention that the love for stock is developed and the ground-work laid for the building up of a rurally-minded member.

Experience has shown that more importance must be given to the bookkeeping section. Some splendid books were exhibited recently by the Yarragon Club members. The winning book disclosed a fully extended pedigree of the calf, with a section devoted to a record of the known production of the ancestors.

Photos of the calf, and of its sire and dam, were pasted into the book. A detailed record of the feeding was shown from the day the calf was received until the day of the Club Show, and also a detailed balance-sheet for the year.

Grade Calf Clubs.

With the exception of eligibility to enter exhibits in the open classes for pure-breds, and to participate in the higher values that rule for pure stock, all the advantages of the pure-breed clubs may be associated with grade calf work.

When pure-bred calves and grades compete in clubs, pure-bred calves are judged on breed type, and the grades on dairy type, and it is quite possible for a fair pure-bred calf to be badly beaten for the club championship by a grade calf of extra quality. A grade calf is one with 75 per cent., or more, of pure breeding of the same breed. A "crossbred" is the progeny of two parents of different pure breeds. "Scrub" is a common term, meaning a nondescript, or of no particular breeding.

Under the Victorian United Cow Test Association there are, approximately, 3,500 herds being tested; the number of cows in these herds totals somewhere about 100,000. Of these herds 70 per cent. are using registered pure-bred bulls, the majority of which are from high-producing pure-bred cows, tested by the Government. Several hundreds of grade cows have produced over 400 lb. butter-fat, while the number that have produced over 300 lb. is very large.

Calves from these tested cows are registered by the Victorian United Cow Test Association if the sire's dam has also been tested and reached the necessary age standard of production. These calves are, therefore, 50 per cent. "production pure bred," and 50 per cent. "production bred" in the grade dam's side. Such calves are tattooed in the ear within 35 days of birth, and in each case a statutory declaration from the owner and tester regarding the animal's breeding can be supplied.

Where a club cannot be organized with pure stock, the next best are the calves just described. These represent a high development of dairy character, and will, when two years old, be an asset of considerable value. If then a member desires a pure-bred calf he can sell his grade heifer, and without help from any other source buy a pure-bred animal.

During last year, an unsuccessful effort was made to organize a pure-breed club at Ballendella. Later, a very satisfactory beginning was made with a number of "marked calves" from cows that had produced over 350 lb. butter-fat under test. Two of these cows averaged 550 lb. each. These calves were purchased at £2 10s. each.

By the time these animals are three years of age, they will have finished their first lactation. The increased value of the original animal, plus the value of her calf, and her year's earnings as a producer, should generally show a sound position on the club member's books. It will, of course, be recognized that where breed excellence is shown, exceptional values may rule.

Each club member's book should faithfully record every item of expenditure and receipts, and further, every effort should be made to develop club work on approved commercial

lines—even in those cases where the parents make gifts of stock to their children. A financial statement such as suggested below should be prepared each year:—

Statement of Income and Expenditure for the Year 1929.

Income.	£	*s.*	*d.*	*Expenditure.*	£	*s.*	*d.*
1st Prize	1	1	0	Pure-bred heifer calf	15	15	0
				30 gallons new milk, at 1s.	1	10	0
				150 gallons skim milk, at 1d.	0	12	6
				32 weeks' grazing, at 6d.	0	16	0
Balance—debit	18	11	6	6 per cent. interest on overdraft	0	19	0
	19	12	6		19	12	6

BALANCE-SHEET.

Liabilities.	£	*s.*	*d.*	*Assets.*	£	*s.*	*d.*
Debit balance	18	11	6	Yearling heifer	15	15	0
Excess of assets over liabilities	2	8	6	Appreciation in value of heifer, 33⅓ per cent.	5	5	0
	21	0	0		21	0	0

Statement of Income and Expenditure, Year 1930.

Income.	£	*s.*	*d.*	*Expenditure.*	£	*s.*	*d.*
Debit balance	23	12	6	Balance, 1929	18	11	6
				52 weeks' grazing	3	18	0
				Interest on overdraft	1	3	0
	23	12	6		23	12	6

BALANCE-SHEET.

Liabilities.	£	*s.*	*d.*	*Assets.*	£	*s.*	*d.*
Debit balance	23	12	6	Two years old heifer, close to calving	21	0	0
Excess of assets over liabilities	7	16	6	Appreciation, 50 per cent.	10	10	0
	31	10	0		31	10	0

Statement of Income and Expenditure, Year 1931.

Income.	£	*s.*	*d.*	*Expenditure.*	£	*s.*	*d.*
Heifer calf sold at six months	18	18	0	Debit balance, 1930	23	12	6
200 lb. of butter-fat, at 1s. 4d.	13	16	0	30 gallons new milk, at 1s.	1	10	0
400 gallons skim milk, at 1d.	1	13	4	156 gallons skim milk, at 1d.	0	13	0
				12 weeks' grazing, at 6d.	0	6	0
				52 weeks' grazing, at 2s.	5	4	0
				Interest on overdraft	1	8	4
				Balance—cash in hand	1	12	6
	34	7	4		34	7	4

BALANCE-SHEET.

Liabilities.	£	*s.*	*d.*	*Assets.*	£	*s.*	*d.*
Excess of assets over liabilities	48	17	6	Pure-bred cow	31	10	0
				Appreciation, 50 per cent.	15	15	0
				Cash in hand	1	12	6
	48	17	6		48	17	6

In these balance-sheets it is assumed that the member is giving certain labour help, which offsets the cost of tending and milking the cow. Small items of expense that have not been included are medicine, halter, rug, freight, and insurance.

Club work is serving a great purpose, and there is room for some form of club work in almost every rural district.

[I am indebted to Mr. C. F. Morant, of St. Kilda, for several of the illustrations.]

Black Disease of Sheep

Preventive Methods Described

By R. N. Johnstone, B.V.Sc., Senior Veterinary Officer.

BLACK disease of sheep (*Infectious Necrotic Hepatitis*) has been known to exist in the south-eastern portion of New South Wales, in Victoria, and in Tasmania for many years, and from time to time it has engaged the attention of various eminent scientists, amongst whom one might mention the late Dr. Dodd, of the Sydney University Veterinary School, Dr. Gilruth,

A sheep that had previously shown no signs of illness is seen lagging behind the flock on being chased by dogs.

and more recently Dr. Albiston and Dr. Turner, of the Melbourne University Veterinary School. For many years sheep-owners in Victoria and Tasmania have called this disease "Braxy" or "Braxy-like" disease, but the use of that name has been discontinued, and the name Black disease,

An affected sheep. This animal exhibited symptoms of pain, and frequently flexed the head round to the left side

A sheep ill with black disease. Note the extended head and dilated nostrils.

which was in common use in New South Wales, has been adopted in preference.

Braxy, a fatal contagious disease of sheep in Scotland and certain European countries, does not exist in Australia, and the use of the term may lead to confusion in oversea countries, and do some damage to the sheep-breeding industry in Australia.

A sheep dead from black disease. There are no signs of struggling.

Black disease affects sheep of all sexes and all ages from weaners onwards; so far it has not been observed in lambs. It is caused by the Bacillus Oedematiens, which will grow and multiply only in dead tissue. That fact explains why the disease is associated with the invasion of the liver by the liver fluke. When the immature fluke enters the liver through its capsule and bores its way to a bile duct, it leaves behind it a track of

The skin quickly becomes black, and the wool pulls out easily.

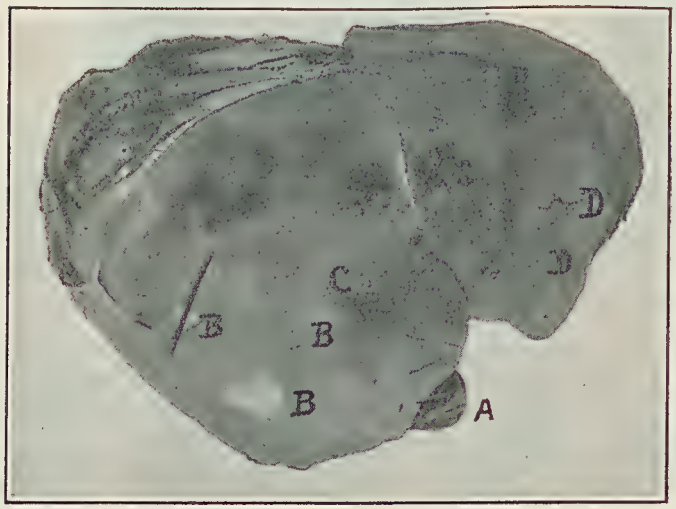
Skin from the carcass of a black-disease sheep, showing the black colour.

dead tissue which provides an ideal site for the growth of this bacillus and the elaboration of its special poison. Thus the disease occurs mostly in the summer and autumn when the young fluke is most active. It commences in December, reaches its peak in February, March, and April, steadies up during May, and as a rule stops in June.

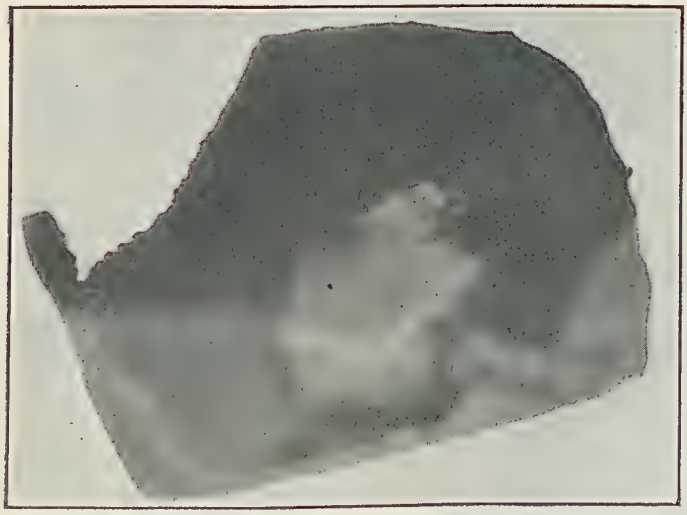
Affected animals are almost invariably in quite good condition, and death occurs suddenly and without a struggle. As a rule, the body is found lying on its brisket with its legs tucked under as though the animal had died in its sleep. One very rarely sees a sheep sick with this disease; usually a few are found dead on the camp in the morning, while the remainder of the flock appear quite healthy and in good condition. Occasionally, however, if an affected flock be driven with a dog, one or more sheep will be seen to lag behind as though unable to keep up with the mob. If one of these sick sheep is forced along it will lie down on its brisket with its legs tucked under it and its head stretched out as though it is out of breath. Within a short time, varying from a few minutes to an hour, the animal will die without a struggle.

After death the carcass turns black and decomposition sets in very rapidly; therefore, a post-mortem examination, to be of any value, must be made almost immediately. This is particularly necessary if specimens are to be forwarded to a laboratory for examination. The organs of a sheep which has been dead for more than an hour will have reached such a stage of putrefaction that it becomes extremely difficult even for the scientist with all his laboratory facilities to be sure of the presence or absence of Black disease.

On post-mortem examination we frequently find a pale or reddish jelly-like material under the skin, especially near the brisket. When the body cavity is opened up we find in it a cupful or more of clear or blood-stained fluid, the colour depending on how long the animal has been dead. The liver will be found to be dark red and full of blood. On careful examination of the surface of the liver, we find one or more light-coloured patches. These vary in size from one-half to 2 inches in diameter; they are irregular in shape and their edges are very clearly defined, being surrounded by a thin, dark-red line. On being cut these patches are found



Liver of a black-disease sheep showing A, the distended gall bladder; B, four necrotic areas, of which one has been incised; C, haemorrhagic areas indicating existing wandering flukes, and D, pitting of capsule following retraction of fibrous tissue, and indicating less recent fluke invasion.



Part of liver of a sheep dead from black disease, showing a necrotic area.

to extend into the liver substance for some depth. On very careful search one can sometimes find an immature fluke in the light-coloured substance.

In the chest cavity we frequently find a small quantity of fluid, similar in all respects to that found in the body cavity. The most important lesion in the chest, however, is a small bag of jelly-like material surrounding the heart. This is enclosed in the pericardial sac—that thin layer of tissue in which the heart is enveloped—and varies in quantity from two to four fluid ounces.

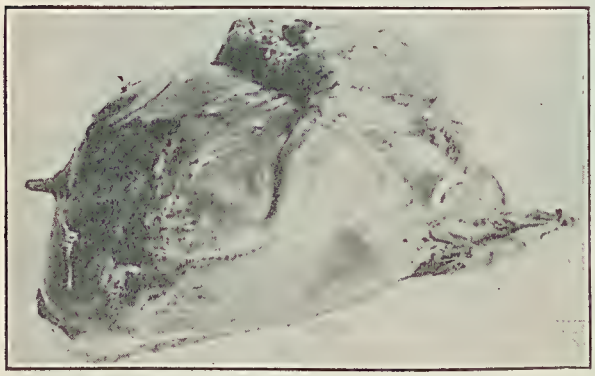
Farmers who are losing sheep under the conditions just described should secure a specimen from a freshly-dead sheep and forward it for examination, so that a correct diagnosis may be made. The whole of the internal organs, including the heart and lungs, should be placed in a kerosene or petrol tin and covered with a weak solution of formalin (one cupful to two gallons of water). If the bowels are too voluminous to be placed in a tin, the rumen or paunch may be discarded. All cut ends should be tied securely to prevent leaking of food material and consequent discoloration of the specimen. The tin should be soldered down and forwarded by rail to Spencer-street railway station, clearly addressed to the Veterinary Research Institute, Story-street, Parkville. When it is not possible to send all organs the liver only should be placed in a half-petrol tin covered with a weak solution of formalin and forwarded. The Director of the Research Institute should always be advised by letter of the despatch of specimens, the symptoms shown by the animal and the disease suspected. At the laboratory the organs are examined for the presence of the germ which causes the disease, or in its absence for evidence of any other disease which may be the cause of death.

Since Black disease exists only on flukey pastures, owners must expect to find that not all deaths amongst sheep are due to it. Sheep may die of acute fluke invasion or a heavy infestation with intestinal worms. If sheep are seen sick for several days or are in poor condition, some other disease or starvation must be suspected. Sheep which die of Black disease are almost invariably in good condition, and they die quite suddenly.

During the past three or four years the organism which causes Black disease, and which was first isolated in pure culture by Dr. Albiston, has been carefully and extensively studied by Dr. Turner (to whom I am indebted for much of the information contained in this article), and as a result a vaccine which will protect sheep against the disease has been developed. Two injections with an interval of a month between are necessary. This work is now being carried out by the veterinary staff of the Department of Agriculture. During last season more than 50,000 sheep were vaccinated by various members of our staff, working in conjunction with Mr. Murnane, of the Council for Scientific and Industrial Research. This work was in the nature of an experiment on a large scale, and the results, which were watched carefully, have been quite favorable. For vaccinations a charge of 2d. per head is now being made. This is necessary to recoup the cost of the vaccine to the Department, and it covers the complete cost of a full treatment of two injections. On badly-affected properties three injections have been found to confer a stronger immunity. Vaccination in the spring is advisable, as the sheep will then be at the strongest stage of resistance during the months when the chance of infection is greatest.

This work has been undertaken by the veterinary staff only, because, by reason of their scientific training, the operation is safer in their hands, and also that sheepowners may

have the further benefit of their advice as to other possible measures of control. Vaccination is carried out only on farms where the disease has been proved by bacteriological examination to exist.



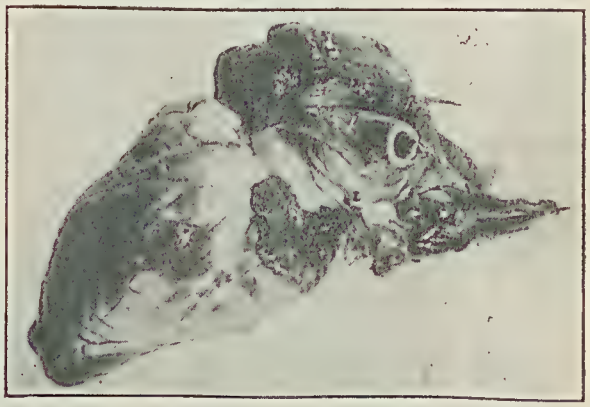
In sheep dead from black disease the pericardial sac usually is tightly distended with clear straw-coloured fluid. The above shows such a heart.

Since the theory, first put forward by the late Dr. Dodd, that the liver must be injured by the young liver fluke before the germ can attack it, has proved to be correct, several avenues of prevention are open, and may be adopted either separately or conjointly. A certain freshwater snail is necessary for the growth of fluke, and thus, if by use of bluestone, we could rid affected properties of this snail Fluke disease and Black disease would disappear. Again, if we could rid all sheep of fluke by the use of carbon tetrachloride the same end would be achieved. As this ideal cannot be reached on many properties because of the conditions present, it is advisable to combine vaccination with the other two precautions, and thus leave no loophole.

To get rid of the fluke snail, all marshes and boggy patches should be thoroughly drained, if possible; the banks of all creeks, water channels, or springs should be cleansed of weeds or other protection for snails; small bags of bluestone should be placed at intervals along the streams; and powdered bluestone should be sprinkled around the edges of swamps or springs, or broadcast on moist patches at the rate of 30 lb. to the acre. To facilitate spreading, the bluestone should be mixed with four times its volume of sand. Bluestone should be spread in December and June.

Sheep should be treated for fluke by dosing them with carbontetrachloride. The dose is 1 c.c., and may be given in a capsule or mixed with 4 c.c. of liquid medicinal paraffin, giving 5 c.c. as a dose. This drug must be used fresh as it deteriorates if kept for any length of time. Three treatments are necessary—one at the end of April, one in the middle of June, and one at the end of July. The cost is about one farthing a dose if the liquid method is used. Thus the year's programme would be—vaccinate in October and November. Spread bluestone in December and June. Drench for fluke in April, June, and July. If this programme is adhered to, both Fluke disease and Black disease would disappear from affected properties.

Vaccination does not kill the germ which causes Black disease. A sheep whether vaccinated or not may carry the germ in its liver, and may remain in apparently quite good health just so long as it is not attacked by the fluke. If the carcass of such a sheep is allowed to rot on the ground after death from any cause whatever, the germs will be spread on the pasture, and may thus gain entry to the livers of other sheep grazing over the same ground. For that reason it is advisable to destroy the carcasses of all sheep which die on your properties, and thus prevent the spread of this and many other diseases.



The same heart as above after incision and removal of pericardium.

This precaution applies particularly to properties on which Black disease is known to exist. If it is not always possible to burn the carcass, a burial ground should be set apart and stock kept away from it at all times.

Leaflets on Black disease and Fluke may be had free on application to the Director of Agriculture.

[*Blocks by courtesy of the Council for Scientific and Industrial Research.*]

Culling and Classing Breeding Ewes

By

N. A. Bowman,
Sheep and Wool Expert.

Two rising four-tooth ewes.

The bigger ewe stands head and shoulders over the other which also shows a certain hairiness.

THE work of culling and classing the breeding ewes is one of the most important tasks in the sheep-breeder's year, and it is one that must be undertaken by the flock-breeder as well as the stud-breeder, no matter how large or small his flock may be. It is of the utmost importance that every sheep-owner, breeding sheep for wool production—breeding sheep that he intends to keep on until their period of usefulness to him is complete—should cull and class every ewe before it goes out into the breeding flock.

What is meant by culling and classing is, simply, dividing the good ones from the bad ones. An owner may argue that, as he has bought a good line of ewes, and has sires that are equally as good, all the progeny must be good ones. Unfortunately, that does not work out in practice. The sheep of to-day have been evolved from very different animals indeed. Originally sheep had not the size of carcass nor the quantity or quality of wool of the modern animal, and the sheep of to-day always tend to "throw back" to those of yesterday. No matter how carefully any flock may be bred, there always will be amongst the offspring a tendency to revert towards the sheep of the non-paying type. Under these conditions, culling and classing—separating the good ones from the bad ones—becomes more than necessary. No one can make a definite rule for culling and classing. This important work must be carried out according to the conditions which present themselves, but there are fundamental principles that should be followed in every case. The sole aim of a sheep-breeder is profit, and this must be derived from the frame and covering of the animals. Therefore, one can give this advice—breed for the largest frame possible for your district, and, at the same time, have that frame packed with wool. But as well as density of wool you must have length and character, handle and style.

Length, of course, refers to the staple, and length also has a direct bearing on quality in this connexion—the finer the quality the shorter the staple. Under these circumstances, therefore, one can have wool too long for one's type, and the sheep-breeder who has any doubts on this point should ask his wool-brokers for a short report on the fleece lines of his clip.

Character is denoted by crimp, the undulations or waves seen on the wool fibre or staple. Any fleece with an even or pronounced crimp from butt to tip, showing plenty of character, is termed a well-bred one. A wool devoid of these waves or crimp is known as a badly-bred one. Wool-growers, therefore, should always

try to breed sheep that will give wool nicely crimped from butt to tip. There is one more consideration. Besides being nicely crimped it should be even in type and quality; in other words, the wool produced on the shoulder and rib portion should not vary to any extent from that on the britch. Providing the wool is showing plenty of character, it is easy to tell if there is any difference. If it is nicely crimped from butt to tip, one can tell approximately the quality by the number of crimps to the inch. The more crimps to the inch the finer the wool. Therefore, if you notice any marked difference in the size of the crimp in the wool grown on the shoulder and that produced on the britch, the fleece is not even in quality.

The necessity for evenness should be borne in mind when a ram is being purchased. There are bound to be faults in type and quality in the wool of many ewes in a flock, and in order to minimize the defect in the progeny, a sire as near faultless in this respect as possible should be obtained.

The time for classing depends on circumstances, but, generally speaking, this important work is carried out some weeks before shearing. That it pays to class and keep on classing has been proved time and again.

Handle and style also are most important. A wool kind in the handle, not over soft, and of the correct type, is as necessary as good crimp and length. One wants all these desired characteristics, but it is no easy matter to obtain them, or when you have them to retain them.

To class successfully, it is imperative that the person undertaking the work be fully conversant with the fundamental principles underlying constitution. The first and all-important requirement in a sheep is constitution, and constitution is indicated by the animal being strong boned, with body long and level on the top, good depth at girth, well sprung rib, wide and deep at the chest, legs well set apart, and the body set square on them. A sheep having these points will almost certainly be a "good doer," with plenty of room inside the trunk for the internal organs, and will have no tendency to disease—and only when a sheep is healthy is it capable of producing heavy quantities of a healthy type of wool.

Size is a point often overlooked. On no account, however, should this requirement be lost sight of, as there must be good breeding

The same ewes as in the previous illustration.

Note the difference in constitution, size and depth and breadth of chest space.

room as well as good feeding room. For Merino sheep, one should aim at big, well-shaped, evenly covered animals, free from body wrinkles. According to the latest research work, this point appears to have a definite bearing on fly strikes. The sheep should also be free from any trace of kemp or hair, and at the same time be well woolled down to all points. The same generally applies to fine Comeback sheep, Polwarths, and Corriedales. For Crossbreds, one should aim at a large framed, robust type, covered with a good style of wool, and in all cases the skin of the animal should be a nice cherry-red colour. The mouth should be examined frequently, and, if failing, the ewe should be culled. As a rule, when a ewe is becoming aged, her wool-producing properties begin to fail, as the food she consumes tends to produce fat on her body. Then the wool takes on a starved appearance and cuts a light fleece.

The secret of breeding up a flock to an even, uniform type is to start with soundly-bred ewes, and to keep culling, as far as it is possible, all sheep not conforming to that type. In order to do this, one must have an ideal in mind, and aim to attain it. When this is accomplished, the breeder's next move is to keep this standard of perfection. All culled sheep should be ear-marked, so as to avoid any chance of a mistake later on, when off-shears sale time comes along.

Wise Selection of Rams Helps Successful Mating

By N. A. Bowman, Sheep and Wool Expert.

SUCCESSFUL mating is the corner-stone in the building of any flock of sheep, and to obtain the best possible returns from any flock a wise selection of sires is essential. At times such as these, it is necessary for the grower to increase his returns through the main avenue available to him—by growing more and better wool. Those desirable results depend largely on successful mating, and growers should aim to mate good sound station-bred ewes with soundly-bred sires of registered flocks.

The first consideration in the selection of a sire is to be assured that he is pure-bred—that is, chosen from a pure-bred flock. The reason for insisting that a ram must be pure-bred is that a nondescript or mongrel animal has not the power of transmitting to his progeny the characteristics of the breed he is supposed to represent.

A Good Head.
A ram with such a head should prove a good sire.

Secondly, he must be of sound constitution; in other words, there must be no tendency to disease. He must have both width and length of body, a well-sprung rib, and depth at the shoulder and girth. His general appearance should be one of symmetrical proportions.

Thirdly, a sire must present a bold, masculine appearance. Generally, the head is a valuable indication of type. A ram with a good bold look gives one the idea that he is fit to be the guardian of a flock.

Fourthly, he must be covered with a good fleece of wool, even in quality, and true to the type required of the particular breed. If the sire be of the Merino, Polwarth, Corriedale, Lincoln, Border Leicester, English Leicester, or Romney Marsh breed, a crimp (undulations or waves seen on the wool fibre) should show through the wool; this crimp must be even and well-defined—this denotes character.

Fifthly, he must be free from any trace of hair or kemp. This fault should be particularly looked for towards the breech. It is more liable to be found in Merinos, Polwarths, and Corriedales than in other breeds.

A Head with Undesirable Characteristics.

When selecting sires for wool-producing flocks, on no account should "density"—compactness of growth — be forgotten. Quantity as well as quality counts very considerably.

If the intention be the raising of fat lambs, the purchaser should endeavour to obtain a sire as firm in the flesh as possible—such a ram will beget a better class of lamb. He should be long, deep, thick, with a straight, strong back, and have style, vigour, and masculine bearing.

For ordinary flock purposes, conform as closely as possible to the standards set for the breed.

Briefly speaking, the objects of the sheep-farmer are one of three—

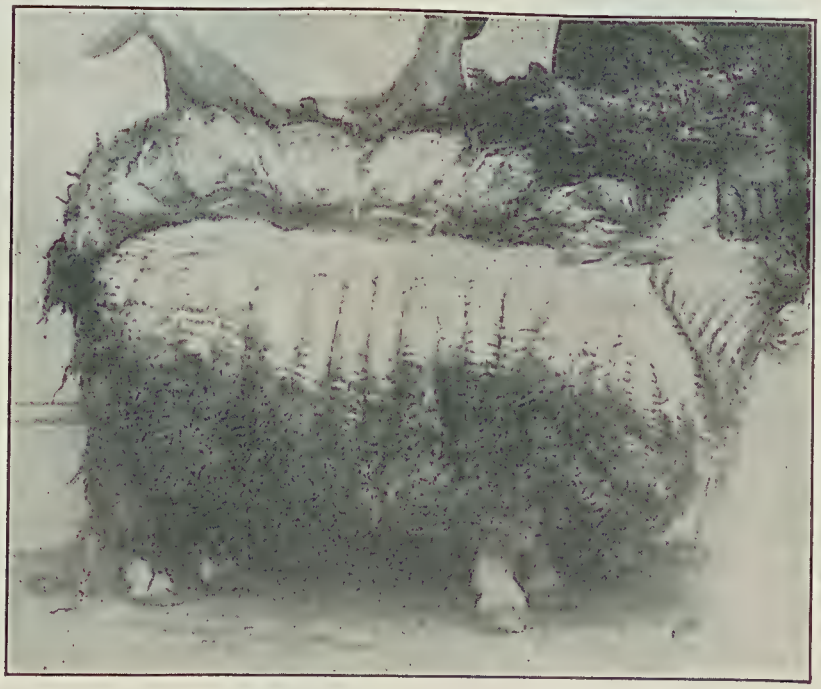
1. Wool production.
2. Wool and mutton.
3. Fat lamb raising.

Under general conditions the Merino, Polwarth, Fine Comeback, and Corriedale are most suitable for wool production, provided, of course, they are placed in a suitable locality. Having decided on the breed thought to be best suited to the particular district in which one has cast his lot, the farmer must make sure of purchasing well-bred stock in order that maximum returns may be obtained from the flock.

The ideal to aim at is the sheep that will develop the largest frame possible, and to pack on that frame the right type of wool, i.e., wool having length, colour, character, density, and style. For wool-growing it is necessary to keep to one type. The sheep-farmer must not chop and change about in an endeavour to keep pace with fashion which is continually changing. Having found the right type, keeping to it and improving it is far better than changing and shifting about.

When purchasing a line of ewes for the purpose of wool production, one should arrange to get cast-for-age sheep from some well-known station property in order that the resulting flock may have "blood" or "strain."

Another very sound reason for purchasing cast-for-age ewes is that their owner was evidently satisfied to breed from them. It might be that in buying young sheep one could get only "culls" which the owner thought were not good enough for breeding purposes. Further, it is a good plan to purchase from a station of good reputation, because there one is more likely to get a line of sheep even in type, and thus, later, the cutting up of the wool clip into too many lines during shearing will be avoided. In purchasing ewes for fat lamb production, size of carcass must not be forgotten. A ewe of a good frame with plenty of room for feeding and breeding is necessary if a nice stocky type of lamb is to be produced. Due consideration, of course, must be given of their wool-producing properties as well.



Character in Lincoln Wool.

Young Trees for Sale

DURING the past month the Victorian Forests Commission has been conducting field days for the experimental planting of various species of trees suitable for shelter belts in the Western District. As a result of these practical demonstrations it is anticipated that the planting of windbreaks will be carried out on a more scientific basis.

Following its campaign, and in order to encourage the farmer to plant trees not only for the protection of his cattle but also for the general improvement of his farm, the Commission has made available a number of trees at specially reduced rates. No farm can be an efficient unit without judicious planting of useful trees.

The following is a list of trees available at the Macedon State Nursery and the prices of each :—

Cupressus Lusitanica	Coastal and cool climate	15s. per 100
,, *macrocarpa*	Western	10s. ,,
Eucalyptus botryoides	Gippsland	7s. 6d. ,,
,, *sideroxylon*	Midlands	7s. 6d. ,,
,, *pilularis*	Alpine and North-east	7s. 6d. ,,
,, *globulus*	Gippsland, Mountain	7s. 6d. ,,
,, *calophylla*	Frost free—warm	3s. per doz.
Salix laurina and others	Coastal and streams	15s. per 100
Acacia saligna	Coastal	7s. 6d. ,,
,, *longifolia* var. *florabunda* ..	Coastal	7s. 6d. ,,
,, *normalis*	Midlands, south, north-east	7s. 6d. ,,
,, *prominens*	Warmer	7s. 6d. ,,
,, *discolor*	Gippsland, cool climate	7s. 6d. ,,
,, *longifolia*	Coastal	7s. 6d. ,,
Angophora	Cool climate	17s. 6d. ,,

Applications should be addressed to the Secretary, Forests Commission, Melbourne, and should state the locality in which it is proposed to plant the trees. These applications and any requests for information regarding suitable types of trees will be given every attention.

Orchard and Garden Notes

By Edward E. Pescott, F.L.S.

A Japanese Chrysanthemum.

The Flower Garden.

THIS is an excellent time for the sowing of seeds of all of those flowers which make such a splendid display in summer and autumn. Included in the list are Aster, Zinnia, Dahlia, Cosmos, Phlox, Marigold, Sunflower, Balsam, and others.

In sowing seed, make a well-drained bed of light sandy loam, and, having dug it over, trample it well to make a good firm bed. Then lightly loosen the surface, and sprinkle the seed among the loose soil, gently pressing it with the hand. Sprinkle lightly some well-broken leaves or very old manure on the top, to make a cool shelter for the seed. Keep this moist on windy days, and pull up all weeds as soon as they appear.

If the nights are cold, it will be well to cover the beds with sheets of paper.

Cinerarias are now coming into flower. To get the best results, these should be watered twice a week with weak liquid manure. Keep the plants protected from cold and frost by covering with hessian or papers. If the leaves are attacked by the leaf miner, each leaf should be removed; if the attack be serious, the leaves should be burned. On the first signs of attack the plants should be well sprayed over with tar water; this can be made by pouring a quart of boiling water on half a pint of Stockholm tar, and afterwards making up to five pints with cold water.

Chrysanthemum sets and rooted cuttings should now be planted out in the beds. The soil should be enriched with a good supply of stable manure and a handful of bonedust for each plant. In setting out, a fine clump may be established by making a triangle of three plants 9 inches apart. These plants should be placed in a sunny position; but also in one which will be protected from the winds in autumn, when the plants are in bloom. Watch roses for aphis, and spray with nicotine sulphate whenever this pest becomes apparent.

If Gladioli have not yet been planted, the corms may now be set out; these will give blooms in summer.

Cannas may be planted out now. It pays to lift the old clumps and break them up into small pieces before planting. Ample supplies of stable manure, to which a handful of bonedust has been added, should be worked into the soil. Cannas like a fairly heavy soil, so that the moisture will be retained; the soil, however, must be well drained.

In the Vegetable Garden.

All plants of the Cucumber family, such as Cucumber, Melon, Marrow, Squash, and Pumpkin, should be planted out. In the pumpkin section, one of the best varieties is that known as the Shamrock, a fruit having three divisions, and of a grey-green colour. In the Cucumber section, the apple-shaped cucumber is very prolific, and an excellent plant for the home garden. All plants of this family need a very rich soil; and, in summer time, ample water.

These plants carry their male and female flowers separately, and in the early part of the season, when the weather is not yet hot, the female flowers (those showing the small green immature fruit below the flower) should be dusted with pollen from the flowers bearing the stamens.

It is advisable to set out these plants in a shallow depression, so that the water may be freely given to them in the hot weather.

Sow seeds of lettuce in a well prepared bed; place them in rows a foot apart. Later, the seedlings may be thinned out for transplanting; a plant may be left every 3 or 4 inches for an early crop.

Sow Radish, and Mustard and Cress broadcast in beds in a sunny spot. These plants should be ready in five or six weeks' time.

In the Orchard.

The time is arriving when orchard spraying will be necessary. For black spot of apples and pears, use the lime sulphur spray when flower buds have formed; the second spray to follow when the petals fall, and the third a fortnight later. Bordeaux mixture may be used instead, but there is always a tendency for this spray to cause russet spots and markings on the fruit.

Codlin moth spraying will soon demand attention. The calyx spray is urgent and important; this may be given by using arsenate of lead, followed by a second, in ten days' time. Later sprays at monthly intervals (depending on the weather) may be given with a white oil emulsion.

Scale on fruit trees should be sprayed at once; a contact spray, such as white oil or lime sulphur, is advisable.

In using all sprays, the importance of a spreader must not be overlooked.

Records of blossoming of various trees should be noted this season, so that suitable new trees or grafts may be obtained for cross-pollination.

Book Received

GRASSLAND AND GREEN CROP FARMING, Arther Yates & Co. Ltd., Sydney: An interesting and instructive volume dealing with the establishment and improvement of pastures. The various grasses and clovers are described and their uses outlined. Several chapters are devoted to the principal fodder crops, while root crops also are dealt with. The book is published at 1s., but bona fide graziers and farmers may obtain free copies on application to the publishers, Messrs. Arthur Yates & Co., 184-6 Sussex-street, Sydney.

Farm Produce Agents Act

List of Licences Issued*

Name of Licensee.	Court where Issued.
Anderson, Leslie Wilson	Melbourne
Gerrand, William	Bendigo
Orlando, Antonio	North Melbourne
Puller, Reuben	Port Melbourne
Wallis, Harold Osborne	Melbourne

* Supplementary to list printed in this *Journal* for July, pp. 366–8.

Professional Papers

[This section is devoted to professional papers and articles of a scientific character.]

Experiments in Hoary Cress Control

No. 1.—Field Trials

By A. Morgan, B.Agr.Sc., Weeds Research Officer.

THIS series of experiments, having as its object the formulation of an effective practical method of control of the weed known as "Hoary Cress," has been carried out at the State Research Farm, Werribee, under the direction of the Agricultural Superintendent (H. A. Mullett, B.Ag.Sc.), during the period 1926 to 1929. The widespread nature of the Hoary Cress infestations in this State, and the failure of ordinary preventive methods to eradicate it, necessitated a thorough investigation of the habits of the plant, and trials of any methods holding out promise of successful eradication or control.

Of the methods tested at Werribee, regular cultivation over an extended period, and spraying with arsenic pentoxide, proved to be the most effective, while applications of salt, calcium chlorate and similar treatments were found to be ineffective. It was found that weather conditions preceding spraying, and the amount of arsenic pentoxide applied, were factors greatly influencing spray efficiency. A number of minor problems which arose during the tests were investigated as far as seemed, at the time, to be consistent with the main objective.

Hoary Cress (*Lepidium Draba*, L.), also known under the names "White-weed," "Chalk-weed," &c., is a perennial weed of the mustard and charlock order (Cruciferae). Description—

Stems.—Erect, rigid, to 18 inches in height.

Leaves.—About 3 inches long by 1 inch broad, the margins wavy or slightly toothed, with a characteristic "hoariness" due to a felt of very fine hairs. The basal leaves are shortly stalked, the stem leaves stalkless and clasping the stem.

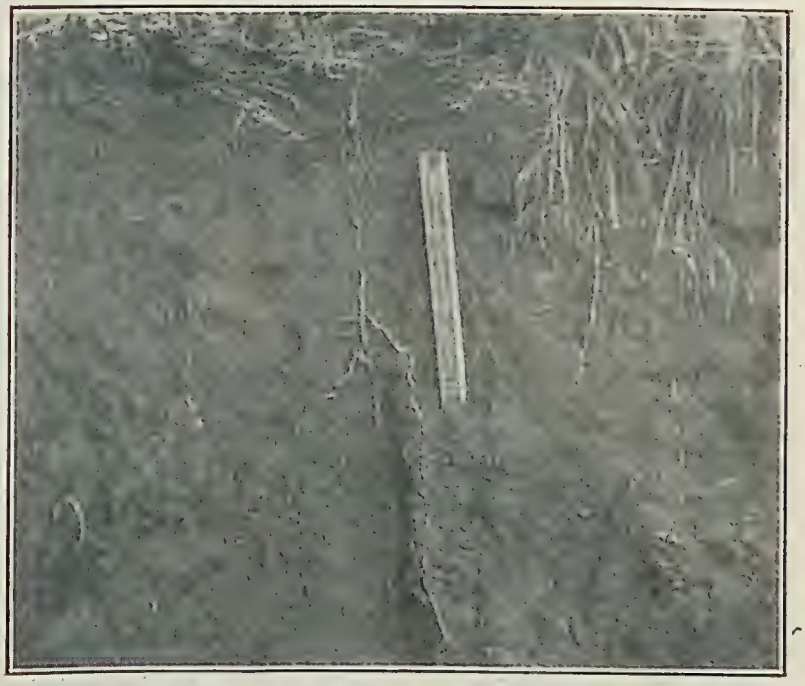
Flowers.—Very numerous, small, white, and borne on slender stalks, the whole forming a dense, more or less flat-topped inflorescence.

Hoary Cress (*Lepidium Draba*, L.)

a. Seed; *a'.* seed vessel; *b.* early stage of seedling; *b'.* cotyledon or seed leaf; *c.* second stage of seedling; *d.* third stage of seedling; *e.* flowering plant; *e'.* flower.

(*Ministry of Agriculture and Fisheries.*)

Pods.—Inverted heart-shaped, about one-sixth of an inch long, with a persistent style at the apex. These pods normally contain two small reddish-brown seeds, but in many cases only one seed is fully developed.



This photograph shows the depth of penetration and sparse branching of the "main root" of the plant. The actual root penetration in this case was to a depth of 6 feet.

A native of Europe and Western Asia, this weed has spread gradually to England, America, and Australia, and in every case has become one of the worst weeds of arable land. When grown from seed in pots at Werribee, the plants did not flower until the second year of growth, while the root-system during that period penetrated to a depth of over 4 feet. This delayed flowering is probably an important factor favoring the establishment and spread of the weed, since it enables the young plants to pass unnoticed until a strong root-system has been formed.

Illustrating the spread of the plant by means of so-called "rhizomes". It will be noted that, after sending up new shoots to the surface, the "rhizome" turns downwards and penetrates as deeply as the "main root".

The above-gound portion of the plant gives no indication of the extensive root-system which is the direct cause of the difficulty of control. A study of the root-systems of a number of old plants which had developed under varying field conditions demonstrated that the chief components are as follows:—

A.—The *main root*, which may penetrate more than 6 feet downward through the soil, is up to $\frac{3}{8}$ inches in diameter at the crown, tapering gradually throughout its entire length.

B.—"*Lateral*" *roots*, generally few in number, arise from

the main root at a depth of from 12 to 18 inches, and, after diverging a short distance from it, penetrate deeply as shown in the photograph.

C.—A number of short roots, up to 4 inches long, arise from the main root and laterals.

D.—Fibrous roots arise from the main roots, laterals and short roots at frequent intervals, and form a branching network over the faces of soil cracks.

E.—Horizontally-spreading roots (often misnamed "rhizomes") arise from the main root below the soil surface, and may extend for a distance of 4 feet from it, giving rise to new shoots at irregular intervals before turning down and penetrating more or less deeply into the soil.

Extensions of the vascular tissue to the outer boundary of the root occur along the whole of the root-system; these produce shoots under favorable conditions, so that the danger of cultivating a patch of this weed, except in the manner to be described, cannot be over-emphasized. Pieces of root are likely to be carried by implements some distance over a field, and under suitable soil conditions may establish a number of new patches until the greater part of the field is infested.

In view of this feature, it is important that small patches of hoary cress which are found growing in a field should be isolated (by pegging out, fencing, or other convenient methods), and should remain uncultivated unless the method of cultivation employed is of the nature described in a later paragraph. In such cases, of course, the plants should be prevented from seeding.

The first experiments in hoary cress control were commenced at Werribee in May, 1926. Very little was known of the weed upon which to base the tests, except that it had the reputation of being very difficult to eradicate. A set of tests embodying principles which had been successfully applied in the control of other weeds was laid down, the main divisions being methods of cultivation, salt applications, thatching, and herbicides applied as solids and as sprays.

Repeated cutting by means of special cultivation implements proved to be the only *completely* successful treatment. Three plots, each 33 feet by 44 feet, were cultivated as follows:—

1. Weekly cultivation to a depth of 3 inches, using a small scarifier fitted with a weed knife.
2. Fortnightly cultivation as in (1).
3. Fortnightly cultivation as in (1), after a salting at the rate of 2½ tons per acre.

On the plot cultivated weekly no green leaves appeared during the interval between cultivations, but on those cultivated at intervals of a fortnight green leaves were produced, during the active growing season of the weed, in about ten days after each cultivation. Despite the fact that no green leaves were produced on the weekly plot during the twelve months ending May, 1927, no decrease in the number and vigour of the plants present was apparent, many brittle, sappy, white shoots being found on digging at various parts of the plot. Towards the end of 1927, however, it was noted that the number of plants appearing on the fortnightly-cultivated plot during the intervals between cultivations was rapidly decreasing, and finally no green shoots appeared.

At this stage no living hoary cress roots were found on digging, and to ascertain whether complete eradication had been obtained a portion in the centre of each plot, representing approximately one-third of the total area, was isolated by a surrounding trench 18 inches deep, lined with sheet iron. All roots discovered during the trenching were dead, consisting only of the dried outer layer loosely investing the woody remains of the vascular tissue; all soft tissues (cortex) had disappeared. Commencing from early 1928, the isolated central portion of each plot was allowed to remain uncultivated (weeds such as pepper cress, hogweed, &c., being hoed out from time to time) in order to ascertain whether at levels below 18 inches there were roots sufficiently alive to send up new shoots to the surface, while the remainder of the plot was cultivated as before to remove the possibility of re-infestation from the edges of the plot.

The results of this test were very satisfactory. Up to the present time, over three years after the discontinuance of the cultivation of the central portions, no plants have appeared on the plot cultivated weekly or on that cultivated fortnightly. On the plot cultivated fortnightly and salted once at the rate of 2½

tons per acre one plant has appeared. From the results of the tests described, it appears that, for success with the cultivation method under Werribee conditions, the intervals between cultivations should not exceed fourteen days, and the cultivations should be regularly carried out for a period of not less than two years.

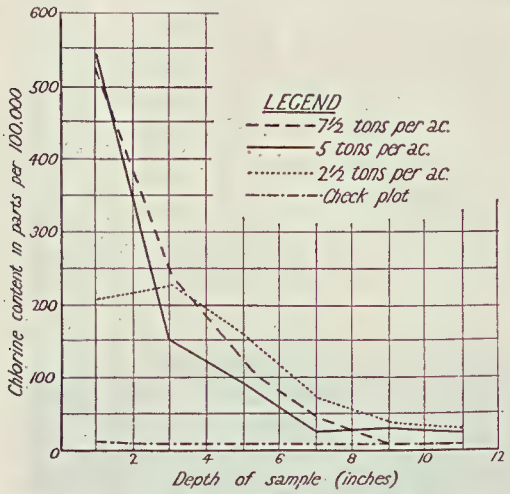
It is interesting to note that in California regular cultivation for a period of one year was not successful as a means of control. The method found successful on the test plots at Werribee is now being tried out on larger areas, where it is expected to prove equally effective. Meanwhile, further tests are in progress to determine if the minimum number of cultivations necessary for complete eradication may be further reduced by special methods. It may appear at a first consideration that the cultivation method of eradicating hoary cress is not commercially practicable. Consider, however, the case of a large field in which a small patch of the weed has become established. Without attention, this small patch in a few years may be responsible for a heavy infestation of the whole field. The cost of the cultivations necessary to eradicate the original small patch may be regarded, therefore, as a premium paid to insure the remainder of the field from infestation. The cost of the cultivations necessary to eradicate the weed, when compared with the decrease in value of the totally-infested field as compared with its original value, is not excessive. Viewed from this stand-point, the application of the cultivation method of eradication to small patches is, economically, a sound and practical procedure. The system has been introduced into practice on patches occurring in large fields at the Werribee State Research Farm.

Salting as a Means of Control of Hoary Cress.

Although many variations of the salting method were tried, no results were obtained which indicated that the method might be successfully employed at Werribee. The applications ranged from 2½ tons per acre up to 30 tons per acre, the coarse salt being broadcast. While the above-ground portions of the weed were killed in all cases, new shoots quickly appeared. Since it was reported that good results were obtained in other parts of the State with salt applications, borings were made on the salted plots to ascertain the cause of failure at Werribee. Analyses of soil samples taken at different depths showed that

Hoary Cress in bloom taking possession of a wheat crop.

the penetration of the salt into the subsoil was not great, and it was also evident that uniform distribution of the salt over the plot was not obtained. While rain assisted the penetration of the salt, it also tended to concentrate it in small depressions. Graph I. showing the chlorine content in parts per 100,000 against the depth of sampling illustrates that, for saltings of 2½, 5, and 7½ tons per acre respectively, the chlorine content was high in the surface 2 inches, but rapidly decreased until, at 8 to 10 inches, it was very little in excess of the normal chlorine content of the soil. Thus the root below 8 to 10 inches was unaffected, and capable of putting forth fresh shoots.



Graph 1.—Showing the penetration of salt in Hoary Cress Plots, Werribee, 1926-27.

Graph I. is not intended to give a comparison of the chlorine content induced in the various soil layers by the varying applications of salt per acre, since owing to the great variations in the distribution of the salt an average of a large number of borings would be necessary, but it demonstrates that the tendency towards poor penetration is a general one.

The presence of a heavy clay subsoil suggested that a better penetration of the salt might be obtained by placing it in holes bored at regular intervals over the plot. Holes 3 inches in diameter and 18 inches deep were regularly spaced, one hole to each 4 square yards; 5 tons per acre was applied as a surface dressing, and filling the bores required a further 2½ tons per acre. The results were disappointing, and the method was abandoned.

Hoary Cress Inflorescence.

Similarly, thatching with 3 inches of straw, a method found effective in the case of patches of Californian Thistle, while able to keep the weed in check for a short period, was a complete failure, the final stage being a dense mat of luxuriant hoary cress shoots over the whole of the surface of the thatch. Thatching in a similar manner after a salting of 2½ tons per acre gave an identical result.

Arsenic Pentoxide Spray as a Control.

After cultivation as described, the next best control measure proved to be spraying with a 6 per cent. solution of arsenic pentoxide. This has been found capable of completely eradicating up to 93 per cent. of hoary cress for a period of twelve months after treatment. The relative success or failure of the treatment is dependent on—

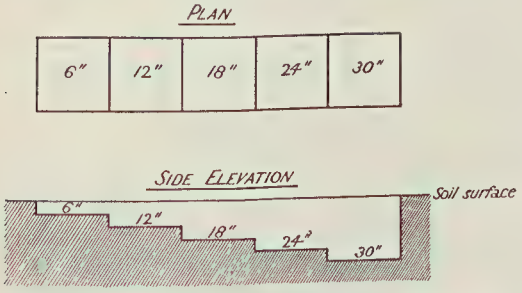
(*a*) The amount of arsenic pentoxide applied;

(*b*) The weather conditions preceding spraying; and

(*c*) The soil moisture available to the plants at the time of spraying.

Of the spray fluids tested in 1926 only those containing an arsenic compound as their main constituent were found promising, while those containing a high percentage of arsenic pentoxide were far more effective than any others. Roots of hoary cress plants sprayed in September, 1926, were dug up in the following month, and were found to have been killed to depths ranging from a few inches up to 3 feet 2 inches. After the death of the root, the starch reserves of the cortex had been attacked by the saprophytic fungus Aspergillus glaucus and practically destroyed. A number of these roots were tested in 3-inch sections for the presence of arsenic, which was found to be present in small amount in all parts showing the attack of the Aspergillus glaucus. The cause of the root-kill was thus established as absorbed arsenic pentoxide, and the extent of the kill was shown to be a direct consequence of the depth of penetration of the herbicide within the root-systems of the treated plants. It remained, then, to prove that the spray could bring about the death of all roots of the weed to a depth sufficient to prevent them from producing new shoots capable of reaching the surface and re-infesting the upper layers of the soil. An attempt was made to determine this critical depth of root-kill by the following experiment:—

In August, 1926, a trench 5 yards long by 1 yard wide was dug in an area heavily infested by hoary cress, and the trench was divided into five sections of which the respective depths were 6 inches, 1 foot, 18 inches, 2 feet, and 2 feet 6 inches. This is shown in plan and side elevation in Diagram I.



Diag. 1.—Trench cut to ascertain critical depth of root kill.

These sections were isolated from each other and from the surrounding soil by lining with sheet-iron. Soil free from roots and seeds of the weed was used to refill the sections. With this arrangement, the hoary cress shoots produced in each section from the roots below the trench were forced to grow to a minimum length of 6, 12, 18, 24, and 30 inches respectively in order to reach the surface and produce green leaves.

Hoary cress shoots appeared on the surface of the 6-inch section in 39 days, on the 12-inch section in 72 days, and on the 18-inch section in 101 days. The number of shoots which appeared (until sufficient time had elapsed for the three sections to become thoroughly re-infested) was greatest on the 6-inch section and least on the 18-inch section. On the 24 and 36-inch sections no shoots appeared on the surface during the period of three years following the commencement of the experiment.

From the results of this test, it was concluded that the critical depth of root-kill under Werribee conditions was about 2 feet, and the maximum kill of 3 feet 2 inches recorded for the arsenic pentoxide spraying in September, 1926, suggested that under favorable conditions this herbicide might give complete eradication. Tests made in 1927 were not encouraging, however, the depth of root-kill being only to a maximum of 10 inches.

What was the cause of the great variation in the depth of root-kill shown by individual plants on the plot sprayed in September, 1926? Also, why did a similar spraying, on plants in approximately the same growth stage, give a much inferior result in September, 1927? It was necessary to find the answers to these questions in order to understand the action of, and intelligently apply, the spray. The first question suggested that the distribution of the spray might not have been uniform, and that those plants which showed only a shallow root-kill were those which had received an insufficient dose of the herbicide. Another possibility was that plants in different stages of growth at the time of treatment might have shown varying resistances to the absorption and penetration of the spray. The second question suggested that there were other factors of equal or greater importance than the amount of arsenic pentoxide deposited on the plant or the growth stage at the time of spraying. The weather conditions on or preceding the day of spraying seemed in particular to be worthy of investigation. To this end a series of spraying tests was conducted during the period May to November in 1928, a sufficient number of plots being treated to

enable an analysis to be made of the influence of the following factors:—

(*a*) The amount of arsenic pentoxide applied per unit area of plot;

(*b*) The stage of growth of the hoary cress plants at the time of spraying; and

(*c*) The weather conditions at the time of spraying.

The plots were one five-hundredth of an acre in area (3 yards by 3 yards 8 inches). A hand-spray outfit working at a pressure of 100 pounds per square inch was used, and a number of tests were made to determine the spraying technique which would give the most even distribution of the spray over the whole of the plot. Strips of blotting paper were pinned down on a plot of ground according to a regular pattern, and after the area had been sprayed with a measured amount of known dilution of the arsenic pentoxide solution these strips were analysed to determine the amount of the poison present on each strip. A number of trials showed that by spraying in strips of a regular width in one direction, and re-spraying in similar strips at right angles, a satisfactory spray distribution was obtained.

To secure data in regard to the average stage of growth of the hoary cress plants on each plot at spraying, an "organized scatter" method of sampling was adopted. These "counts" also served as a basis of comparison of the efficiency of the respective treatments under test. It was not possible, however, to obtain by this method the degree of exactitude which has been reached by the application of statistical methods to cereal crops. A patch of hoary cress presents an altogether different "sampling" problem to a field of wheat. In the latter, the mechanical sowing produces a more or less high degree of uniformity in the spacing of the plants, and the range of variation in the maturity of the individual plants at any time is not conspicuous. In the weed patch these conditions are completely reversed. A sampling test on an average weed plot showed that if a true picture of the population of the whole plot was required the number of samples which it would be necessary to take would be too large to be practicable, and it was decided to consider only the plants occurring on a few samples. Since from a surface view, it is impossible to determine the individual *plants,* each *shoot* occurring on an area of 12 inches by 3 inches situated at the centre of each square yard of plot was counted and graded according to height and its maturity in regard to flowering or seeding. The counts were repeated in an identical manner at twelve months after spraying, and the various spray treatments were therefore compared on the basis of *percentage shoot-kill;* it is assumed that this value is a reasonable index of the amount of root-kill produced by the treatment. In many experiments in weed control the recounts are made a few months after spraying, but in the case of hoary cress plots sprayed with arsenic pentoxide solution recounts at different times showed that high percentage shoot-kills at three and even six months did not necessarily indicate a good control of the weed. A good control may be taken as one in which the growth activity remains greatly depressed even in the succeeding year.

Each week a number of plots were selected for test, and, after sampling, were sprayed according to a regular programme of dilutions and amounts of spray, so that a comparison of similar treatments was obtained under varying weather conditions and at all stages of growth and maturity. The meteorological data were obtained from the records of the farm observatory adjacent to the plots. The time of spraying of each plot and general notes on showers, &c., were recorded. The twelve months recounts were concluded in November, 1929, and an analysis of the percentage shoot-kills obtained appears to show that, at Werribee, the more important factors influencing the efficiency of arsenic pentoxide spraying as a means of control of hoary cress are—

I. The amount of arsenic pentoxide applied per unit area of plot;

II. The average daily rainfall for the week preceding spraying;

III. The mean daily maximum air temperature for the week preceding spraying;

IV. The average daily evaporation (from a free water surface) for the week preceding spraying; and

V. The type of root-system possessed by the plants sprayed.

Later, by means of pot experiments conducted under controlled conditions, steps were taken to confirm these tentative conclusions.

I. The Amount of Arsenic Pentoxide Applied per Unit Area.

In the following averages are included many plot results which show the depressing effect on spray efficiency of high rainfall in the week previous to spraying; the figures do not represent the maximum percentage kills possible under weather conditions suitable for arsenic pentoxide treatment.

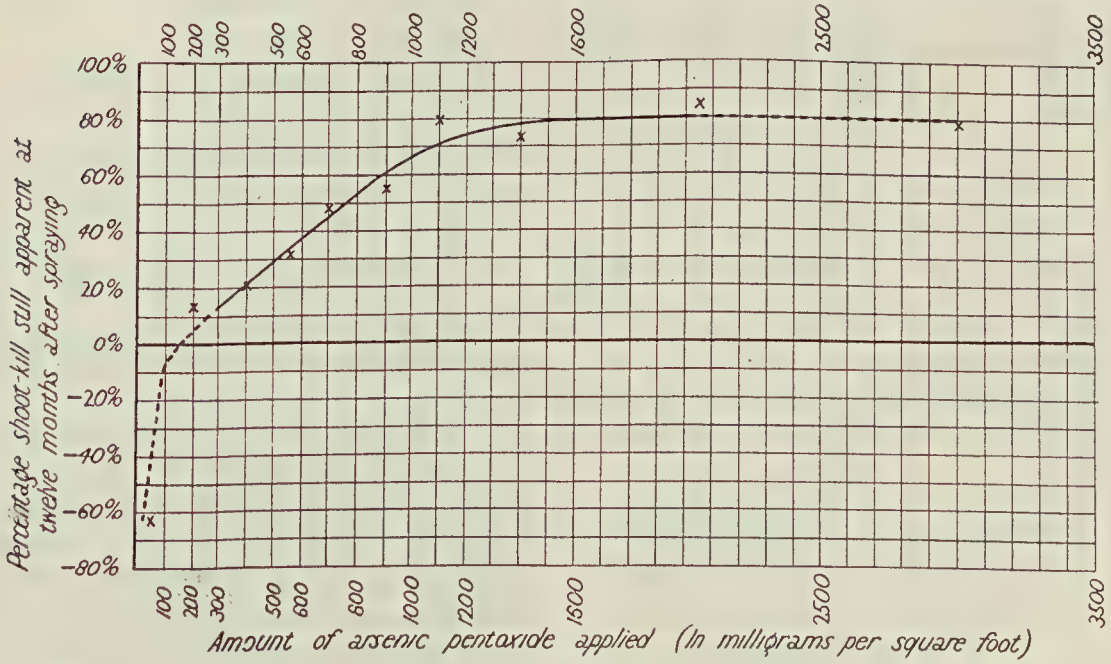
Table 1.—Showing the Influence of the Amount of Arsenic Pentoxide Applied per Unit Area on the Efficiency of the Spray Treatment.

Amount of arsenic pentoxide applied.	Shoot-kill still apparent at twelve months after spraying.
Milligrams per sq. ft.	Per cent.
100	— 62·3
101– 300	+ 14·7
301– 500	+ 21·6
501– 600	+ 31·0
601– 800	+ 47·8
801–1,000	+ 55·5
1,001–1,200	+ 80·0
1,201–1,600	+ 74·3
1,601–2,500	+ 85·0
2,501–3,500	+ 77·6

This table shows that the efficiency of the spray steadily increases as the amount of herbicide applied to the plot is increased, up to about 1,000 milligrams per square foot. Beyond this point, the increased percentage shoot-kill obtained is not justified in view of the expense entailed. This is perhaps more clearly shown in the accompanying graph. The negative average shoot-kill for arsenic pentoxide applications between 0 and 100 milligrams per square foot indicates that the check given to the plants by these light sprayings is not sufficient to prevent the normal vegetative reproduction for any great length of time. An application of 1,000 milligrams per square foot corresponds to a spraying at the rate of 120 gallons per acre of the 6 per cent. solution. This spraying is recommended as being the most effective under average weather conditions, but it will be shown that under eminently suitable weather conditions lighter sprayings are equally effective.

II. The Average Daily Rainfall for the Week preceding Spraying.

Even when a sufficiency of arsenic pentoxide is applied as spray, the results may be most disappointing because of the great influence of rainfall. Where heavy showers

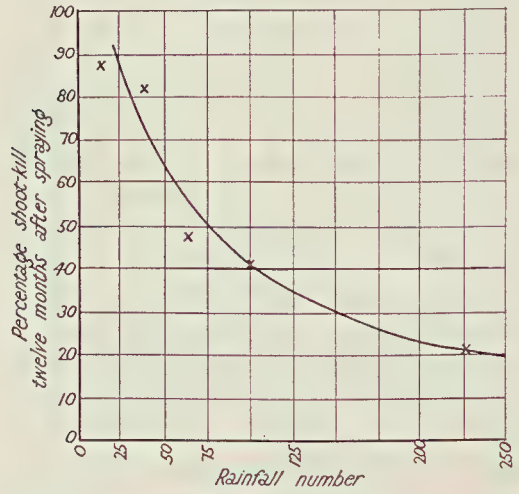


Graph 2.—Showing the influence of the amount of arsenic pentoxide applied per square foot on the percentage shoot kill still apparent at twelve months after spraying.

occur during or shortly after spraying, there may be a direct effect due to the washing off of the spray from the stems and leaves; but, apart from this mechanical action, it is considered that rainfall influences the physiological processes of the plant in such degree as seriously to diminish the absorption and translocation of the herbicide. In Table No. 2 the average percentage shoot-kills for various ranges of average daily rainfall in points of an inch for the week preceding spraying are given for varying applications of herbicide, and from this table the depressing effect of wet weather preceding spraying may be clearly seen.

TABLE 2.—SHOWING THE INFLUENCE OF RAINFALL, IN THE WEEK PREVIOUS TO SPRAYING, ON THE EFFICIENCY OF THE SPRAY TREATMENT.

Average daily rainfall of week before spraying	Points. 0 to 1	Points. 1 to 2	Points. 2 to 4	Points. 4 to 6
[Arsenic pentoxide applied.	Average percentage shoot-kill at twelve months after spraying.			
Milligrams per sq. ft.	%	%	%	%
0– 500 ..	53·6	—13·2	— 0·7	—27·8
501– 800 ..	68·1	46·9	33·6	5·7
801–1,200 ..	92·5	84·3	67·4	65·0
1,201–2,500 ..	89·6	72·5	59·1	..
2,501–3,500 ..	90·6	..	..	49·5



Graph 3.—Showing the relation between the "rainfall number" and the percentage shoot kill at twelve months.

The averages show also what has been emphasized previously in Table No. 1, that the maximum efficiency of the spray is obtained with applications in the region of 1,000 milligrams per square foot; this is seen to hold for all the rainfall ranges experienced at Werribee during the period May to November, 1928. Also, for any of the arsenic pentoxide applications experimented with, an increase in the amount of rain falling in the week prior to spraying is attended by a significant decrease in the percentage shoot-kill.

It can be shown also that the incidence of the rainfall during the week previous to spraying is of importance. Two methods are available. In the first method, the week may be divided into two equal periods corresponding to the first three days and the three days immediately before spraying, and termed conveniently the "beginning of the week" and the "end of the week." For a specified rainfall range, then, the average percentage shoot-kills when the rainfall nearest to the day of spraying occurs in the "beginning" or "end" of the week respectively may be compared as in Table No. 3.

TABLE 3.—SHOWING THE INFLUENCE OF THE INCIDENCE OF RAINFALL IN THE WEEK PRECEDING SPRAYING ON THE AVERAGE PERCENTAGE SHOOT-KILL AT TWELVE MONTHS AFTER SPRAYING.

Incidence of rainfall =	Beginning of week.	End of week.
Average daily rainfall for week before spraying.	Average percentage shoot-kill at twelve months after spraying.	
Points.	%	%
0–1	86·9	76·4
1–2	70·6	63·5

NOTE.—These averages compiled from results of plots receiving applications of 600 milligrams per sq. ft. and over.

While a comparison of efficiency of spray under "beginning" and "end" of the week rainfall is possible only under light rainfall conditions, owing to a fairly even distribution of rainfall over the whole week when the average daily rainfall exceeded two points, it is clear that falls occurring two or three days before spraying exercise a greater depressing effect than falls of equal magnitude occurring earlier in the week before the spraying.

The second method of evaluating the importance of the incidence of the rainfall is

based on an arbitrary system of values assigned to each point of rain falling according to the day of the week on which it is precipitated. It is assumed that a point of rain falling on the day of spraying is seven times as potent in its depressing effect on spray efficiency as a point of rain recorded a week before spraying, and the points of rain for each day of the week are then multiplied by the factors 1, 2, 3, 4, 5, 6, and 7, the summation of the series thus obtained being conveniently styled "the rainfall number." The method is considered to be a more precise modification of the first method which has been described. In Graph III. the relation between the "rainfall number" and the percentage shoot-kill at twelve months is shown.

It appears that a "rainfall number" in the region of 125 for the week prior to treatment is sufficient, practically, to inhibit the absorption and translocation of the applied arsenic pentoxide; the worst possible case would be where about 18 points of rain are recorded just prior to spraying. More exhaustive tests are necessary, however, to establish definitely this conclusion. The discussion of the causes of the great influence of rainfall on the control of hoary cress by arsenical sprays is deferred until the factors of temperature and evaporation have been considered.

III. The Mean Maximum Daily Air Temperature for the Week preceding Spraying.

Owing to the great influence which rainfall has been shown to exert on the efficiency of arsenic pentoxide as a herbicide, it is reasonable, while examining the influence of temperature, to exclude those plots which received falls of rain in the week preceding spraying. Unfortunately, for only one week during the spraying season, namely, 17th-24th July, was no rain recorded, so that a comparison of the results obtained under varying temperature conditions, exclusive of rainfall, was not possible. As a compromise, only those plots receiving an average daily rainfall of less than 2 points in the week preceding spraying were considered. This greatly reduced the number of results available for comparison, and a further difficulty arose because the majority of the plots remaining were sprayed at the end of weeks during which the average daily maximum temperature was within the range 61-65° F. The only significant comparison which could be made is set out in Table 4.

Table 4.—Showing the Influence of the Average Daily Maximum Temperature, for the Week preceding Spraying, on the Percentage Shoot-kill at Twelve Months after Spraying.

Average daily maximum temperature.	Average shoot-kill at twelve months.
° F.	%
61–65	70·4
71–75	90·6

There are, therefore, reasons for believing that, all other factors being equal, an increase in the air temperature, if maintained for a period of one week, will favorably influence the plant in regard to the absorption of the arsenical spray. Following the method used to determine the "rainfall number" for each plot sprayed, "maximum temperature numbers" were calculated, the results being tabulated below.

Table 5.

"Maximum temperature number."	Average shoot-kill at twelve months after spraying.
	%
1,701–1,750	69·1
1,751–1,800	78·8
2,000–2,050	90·6

This table shows also the favorable influence of a period of high temperature preceding the spraying.

IV. The Average Daily Evaporation for the Week preceding Spraying.

Tables 6 and 7 show for various ranges of "evaporation numbers" and "sunlight numbers," the average percentage shoot-kills obtained on plots treated (under rainfalls not exceding a daily average of 2 points for the week preceding spraying), with arsenic pentoxide at the rate of not less than 600 milligrams per square foot, and indicate that increases in these factors are attended by an increased efficiency of the spray application.

Table 6.

"Evaporation number" for week preceding spraying.	Shoot-kill at twelve months after spraying.
	%
·501–1·500	47·8
1·501–2·500	72·2
2·500–3·500	79·5
3·501–5·500	..
5·501–6·600	90·6

TABLE 7.

"Sunlight number" for week preceding spraying.	Shoot-kill at twelve months after spraying.
	%
51–100	29·3
101–150	..
151–200	75·1
201–250	82·4

If the method used to obtain Graph IV. and Tables 5, 6, and 7 is admissible in examining the importance of the various factors of rainfall, temperature, &c., which in combination produce the "weather" for a stated period, then from the graph and tables the following conclusions may be arrived at:—

1. That showers of rain falling in the week preceding spraying diminish the amount of shoot-kill in comparison with that which would be obtained by a similar spraying after a rainless week.
2. That the depressive influence of such showers increases as the precipitation increases.
3. That the depressive influence of a shower of given magnitude is governed by the shortness of the period between its occurrence and the operation of spraying.
4. That high maximum air temperatures, high evaporative power of the air, and high hours of bright sunlight for the week preceding spraying are favorable to the absorption of arsenic pentoxide spray by hoary cress.

The inference is that the hoary cress plant is brought, by continued high temperatures, long hours of sunlight, and coincident high evaporative properties of its surrounding air, to a condition in which it is peculiarly adapted to the absorption and translocation of arsenic pentoxide solution sprayed on its stems and leaves, and that this condition may be rapidly removed at any time by sufficiently heavy showers of rain. The weather conditions which produce this absorptive condition of the plant are also those which cause large water losses from the plant by virtue of increased transpiration; it may be possible that the absorption of arsenical spray by the plant is an attempt to restore its normal water content.

It may be considered that rain falling on the leaves and stems of the plant is also absorbed in this manner in sufficient amount to render negligible the absorption of arsenical spray subsequently applied. Recent work by Kennedy and Crafts (*Plant Physiology*, Vol. 2, October, 1927) on roots of Morning Glory (*Convolvulus arvensis, L.*) supports this theory. In their experiments, roots of Morning Glory plants grown under conditions favouring high transpiration were cut under eosin solution, and the rate and amount of absorption of the coloured liquid was found to be very high in comparison with that noted for plants grown under conditions favouring low transpiration. Further, if arsenical solutions were used in place of eosin solution, the passage of the poison through the root system was rapid and complete with those plants which had been grown under high transpiration conditions, making it possible to kill the root system.

The authors explained these results by the assumption that under sufficiently high transpiration the loss of water may exceed the absorption of moisture through the root-hairs, thus producing a pressure less than atmospheric within the vascular system. This "sub-atmospheric pressure" was considered to be balanced in the plant by the appropriate curvature of the walls of affected cells. Applying these assumptions to the problem of weed-control by chemical sprays of a poisonous nature, Kennedy and Crafts state "there are two distinct functions to be performed by the spray solution. The first is to render the tissues from epidermis to xylem permeable. There are indications that a rapid accomplishment of this would be favorable. The second is to kill the tissue in the root after the solution has been translocated into them. The first of these functions has been accomplished by acids, bases, and hydro-carbons in the commercial sprays in use as weed-killers at the present time, while arsenic has proven most able to fulfill the requirements of the second function." The results of the experiments with arsenic pentoxide spray on hoary cress at Werribee strongly support these views.

[*A second article giving the results of the pot experiments carried out by Mr. Morgan will appear in the September issue of this Journal.*]

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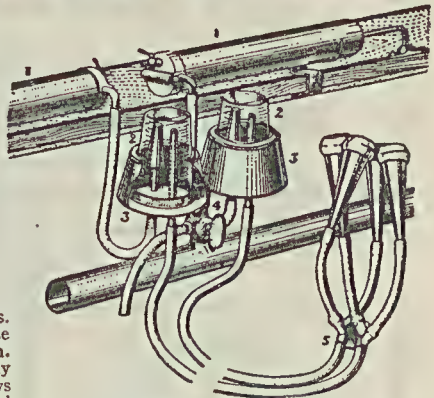

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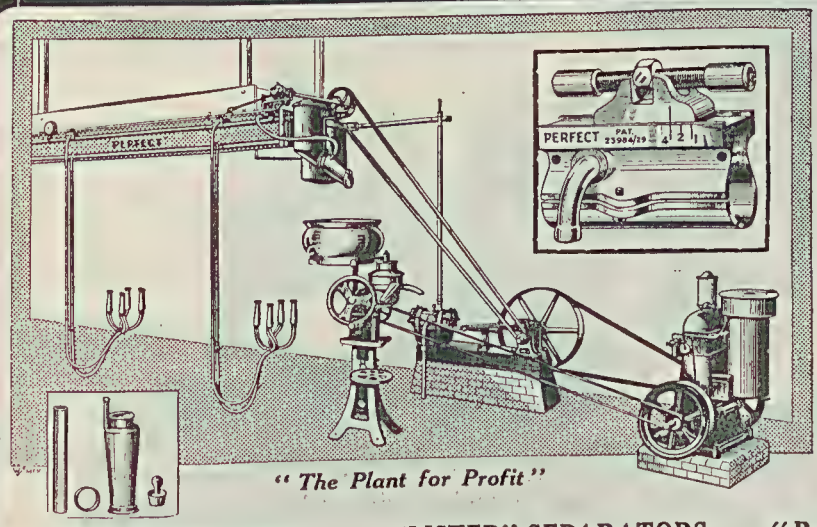

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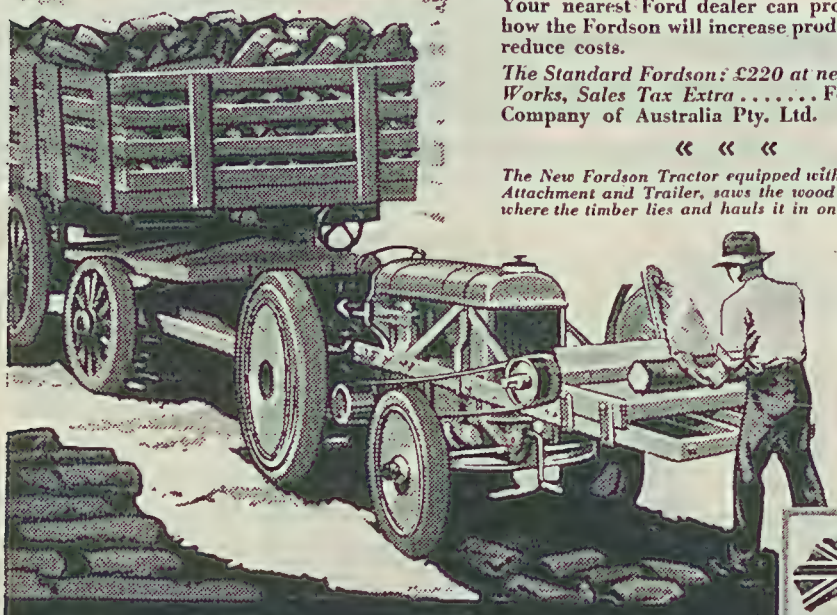

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THE STORES have a capacity of **1,361,072 cubic feet insulated,** and are capable of holding **680,000 boxes of butter,** or **450,000 cases of fruit,** or **600,000 carcasses of lamb and mutton.**

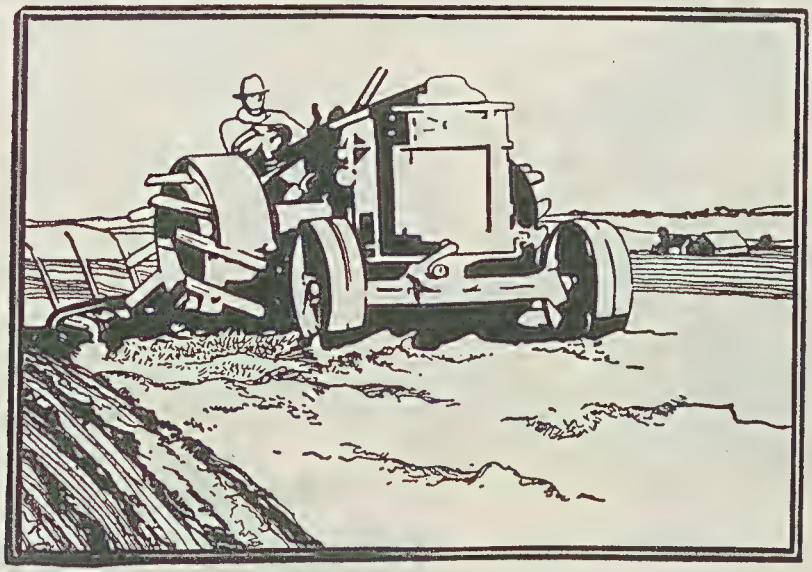
Electric motor power totals 1,000 h.p.

Produce can be placed on conveyors at any point and mechanically carried to any chamber in the building.

THE RAILWAY DEPARTMENT GOODS SHEDS are adjacent to and connected with the Cool Stores by direct lines; delay and exposure of produce through shunting in the Spencer-street yards, or cartage, are thus avoided. The Stores are situated in close proximity to the Victoria Dock, where vessels drawing up to 30 feet of water can be berthed; excellent facilities for the efficient and economical treatment and shipment of frozen and perishable products are provided.

EXPERT OFFICERS are connected with every Branch, so that any one requiring information regarding the production, preparation, and shipment of produce can rely upon being promptly supplied with up-to-date information upon all matters.

RATES for treatment and storage may be obtained on application to the Exports Superintendent, Department of Agriculture, Produce Offices, 605 Flinders Street, Melbourne, C.3.



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Adds Life to Your Tractor

Every year added to the life of your tractor is a clear saving in the amount of capital needed to run your farm. Then why take chances, when Texaco Tractor Oil offers the fullest possible protection to your engine?

It preserves a rich unbroken, heat-resisting film over every moving part and prevents destructive friction. Your engine, too, keeps cooler and cleaner because Texaco is scientifically refined, to remove impurities.

Texaco Tractor Oil does give you this protection—and you can prove it yourself.

THE TEXAS COMPANY (AUSTRALASIA) LIMITED
Branches in all States

TEXACO
TRACTOR OIL

FURTHER TESTIMONY COMES FROM NEW SOUTH WALES

Southwell Bros. of Junee, when writing in reference to Footrot in Sheep, said :—

"YOUR FORMALIN IS NOW OUR SOLE REMEDY."

"The best cure I have ever used"
for FOOTROT in Sheep
—says Mr. A. J. Staughton

Up to now I have spent hundreds of pounds trying all patent dressings and cures; also continually put them through Arsenic; but undoubtedly your Formalin has proved a long way the best cure I have ever used.

Kindly send me 10 gallons (about) more of your Formalin.

(Signed) A. J. STAUGHTON.

"Sickle" Brand Formalin enjoys the highest recommendation of leading Pastoralists throughout the Commonwealth. It is economical and easy to use, swift and thorough in action, and quickly effective as a preventive or cure for Footrot in Sheep.

Sickle Brand
FORMALIN
For FOOTROT
Hardens the hoof in less than 48 hours

Supplied in three-gallon jars at 11/6 per gallon (Melb.); jar extra, returnable. Also 1-gallon and 1-lb. sizes. From our agents everywhere or your own storekeeper.

COMMONWEALTH FERTILISERS & CHEMICALS LTD.
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The main points are—

1. To appoint a permanent and reliable Executor
2. To provide for your wife and family—
   (*a*) Income to your wife
   (*b*) Capital to your children
3. To give general instructions to your Executor

Write or call for our Booklet ***"The Making of a Will"***

THE Trustees Executors & Agency Co. Ltd.

(THE PIONEER TRUSTEE COMPANY OF AUSTRALIA)

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A SHRINKING income and heavier taxation require sounder personal finance.

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A little hard thinking now, some wise planning, backed by regular additions to your Bank balance, will enable you to meet every demand before it meets you!

Act Now!

and bank your savings with the

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ALEX. COOCH, General Manager

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No other paper in the State can offer a group of potential buyers so large or so influential

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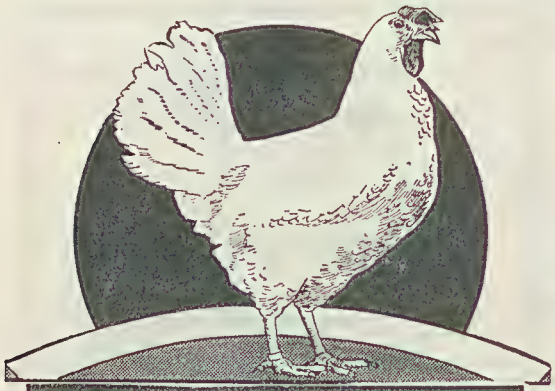

"Dandy" Poultry Food

Is *The Best* For *Your* Fowls

You'll find that the finest birds are those reared right from the "growing chick" stage, on "Dandy" Poultry Food.

The reason is quite easy to understand, for "Dandy" Food contains just the right ingredients to build up growing chicks into strong, healthy birds—and keep them so.

Whether you specialize in "layers" or table birds, you'll find "Dandy" Poultry Food the best of all; its nutritive and stamina-giving ingredients assure consistent and increased egg-production, and add weight of healthy flesh to the table class.

Being a natural food, prepared from the healthy flesh and bone of our own slaughtered animals in equal proportions (without any chemical admixture), it provides the fowls with just the right amount of protein and other constituents necessary to fortify the system and maintain healthy constitutions.

Every ounce of "Dandy" Food is THOROUGHLY cooked and sterilized by a special dry steam process, then ground both fine and course, suitable either for dry feeding or as a mash.

Proportion to Feed: *10 per cent. to 12 per cent. with other food.*

Analysis: *Protein, 60 per cent.; Moisture, 10 per cent.; Fat, 7 per cent.; Mineral Ash, 23 per cent.*

Start with "Dandy" NOW

Obtainable Grocers & Produce Merchants
Supplied in 25, 50, and 100-lb. bags or 1-ton lots

If any difficulty in obtaining, write direct to

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P.O. Box 42 DANDENONG 'Phone, D'nong 44
City Depot: 58-60 King St., MELBOURNE 'Phone, Cent. 3649

Packers of the Famous "Dandy" Hams and Bacon

Testified to by the Govt. Poultry Expert

The Service Driver gives advice . . . .

"We road-service drivers handle the hardest-worked cars you can find. Seven days a week and a clockwork schedule over all sorts of roads, and always loaded. We know what cars can do and we know what makes them do it. And the passengers look to us as mines of information. 'What oil do you use?' . . . 'What's the best petrol?' . . . and so on . . . Anyway, the petrol one's easy to answer. We've tried them all and we're sticking to C.O.R. We get better mileage, sweeter running, and less lost time through repairs. And it's something to know that a real Australian concern is getting our business."

C·O·R

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Employers!

Read these reasons why you should insure in your OWN OFFICE

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2. Participation in Profits
3. Prompt and Equitable Settlements
   (in the interests of Employer and Employee)

INSURANCE BEING COMPULSORY

The Victorian Government established the State Accident Insurance Office to enable all Employers of Labour to obtain

"COST PRICE" INSURANCE

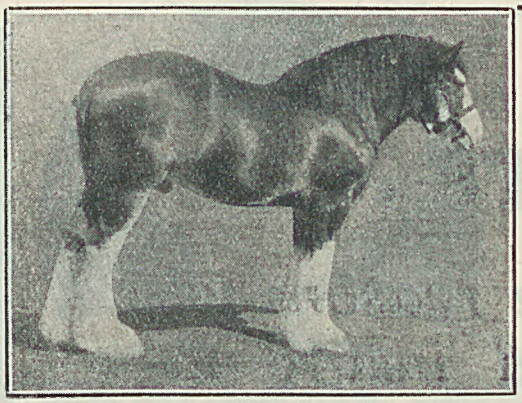
CASH BONUSES PAID to Individual Policyholders

Name.	Occupation.	Premium. £	s.	d.	Bonus. £	s.	d.
Sargood, Gardiner Ltd.	Warehouse	151	15	4	50	11	9
Swanson Bros.	Builders	59	7	6	19	15	9
A. E. Atherton & Sons Pty. Ltd.	Plumbers	256	15	11	53	9	11
Pullar & Co.	Orchardists	30	15	9	7	3	7
Cross, J. R.	Grazier	18	15	0	4	7	6

All these advantages may be obtained by insuring with the

State Accident Insurance Office

OXFORD CHAMBERS, 473 BOURKE ST., MELBOURNE



Clydesdale COLTS

For Sale

State Research Farm, Werribee, Victoria

(Selected from the 1929 drop of Colt Foals)

Suitable for limited service this season

All Sired by "WIDGIEWA NORVAL" (956)

By CRAIGIE MASTERSTROKE (Imp.) (136)
by AUCHENFLOWER (12007 C.S.B.)

"WIDGIEWA NORVAL," Dam: WIDGIEWA NORA (978 C.C.S.B.) by Baron Belmont (imp.) (13973 C.S.B.)
Grand Dam: Lady Ida (485 C.C.S.B.) by Abbot (Imp.) (11987 C.S.B.)

Winner at Melbourne Royal Show—1927, First Prize; 1926, Second Prize; 1928 and 1929, Fourth Prizes; Werribee Show—1927, First Prize and Champion; 1926, First Prize; 1928, Second Prize Reserve Champion.

1. VICTORIA DANCER

Dark bay, foaled 16th October, 1929. A well-grown reachy colt, showing plenty of quality.

Dam: VICTORIA JAZZ (1601 C.C.S.B.) by Baron Wigtown (13884 C.S.B.) (58 C.C.S.B.).

2nd Dam: JOY (408 C.C.S.B.) by Major Oates (285 C.C.S.B.).

(Eligible for registration, Commonwealth Clydesdale Stud Book.)

Price - - 80 Guineas

2. VICTORIA EPIC

Dark brown or black, foaled 2nd January, 1930. A very well-grown shapely, active colt, showing plenty of substance and quality.

Dam: ROMANCE (785 C.C.S.B.) by Baron Wigtown (13884 C.S.B.) (58 C.C.S.B.).

2nd Dam: ROMANY RYE (788 C.C.S.B.) by Major Oates (285 C.C.S.B.).

(Eligible for registration, Commonwealth Clydesdale Stud Book.)

Price - - 80 Guineas

3. VICTORIA GOBLIN

Black colt, foaled 13th October, 1929. A well-grown colt, showing quality and vigour. Dam: VICTORIA PIXY (Appx. B, Vol. 2, C.C.S.B.) by Baron Wigtown (13884 C.S.B.) (58 C.C.S.B.). 2nd Dam: FAIRY (Appx. A, Vol. 1, C.C.S.B.) by Major Oates (285 C.C.S.B.).

Price - - 70 Guineas

For further Particulars apply—

The Manager, State Research Farm, Werribee

By Authority: H. J. GREEN, Government Printer, Melbourne.

THE VICTORIA HERD

of

Red Poll Cattle

Maintained for Milk and Beef at the State Research Farm, Werribee.

FOR SALE

6 BULL CALVES — 6 BULL CALVES

All are progeny of tuberculin-tested stock, and of cows tested in the Standard Herd Test. All are eligible for Registration in the Red Poll Herd Book of Australasia

1.
Born ... ... 19th May, 1931
Sire ... ... Dominion Bright Belgian
Dam ... Victoria La Regal (718 A)
25 Guineas

2.
Born ... ... 15th June, 1931
Sire ... Victoria Major Royal (817 AA)
Dam ... .. Victoria Braid (1654 A)
20 Guineas

3.
Born .. ... 11th February, 1931
Sire .. ... Dominion Bright Belgian
Dam ... Victoria Euphrates (716 A)
24 Guineas

4.
Born ... ... 8th July, 1931
Sire ... ... Dominion Bright Belgian
Dam ... ... Cutty Sark (383 C)
25 Guineas

5.
Born ... ... 5th August, 1931
Sire ... Victoria Royal Ringer (818 AA)
Dam ... ... Victoria Nectar (1665 A)
17 Guineas

6.
Born ... ... 1st August, 1931
Sire ... ... Dominion Bright Belgian
Dam ... Victoria Blue Ribbon (1149 A)
23 Guineas

The prices quoted are based on the butter-fat production of the dam at the rate of 1/- per lb., except in the case of progeny of heifers without completed test, the price then being 10 guineas.

Inspection cordially invited. For further particulars apply to—

R. CROWE, DIRECTOR OF AGRICULTURE, MELBOURNE, C.2;
OR THE MANAGER, STATE RESEARCH FARM, WERRIBEE.

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Australian Sultanas contain the Highest Food Values

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